NATIONAL BUREAU OF STANDARDS
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IDA STUDY S-487

COST-ALLOCATION FOR AUTODIN: AN ECONOMIC ANALYSIS

VOLUME II: Technical Appendices

William F. Beazer
Lance S. Davidson
John N. Fry
Janet Kiernan
William J. Raduchel

September 1977

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Prepared for

Defense Communications Agency

INSTITUTE FOR DEFENSE ANALYSES
PROGRAM ANALYSIS DIVISION

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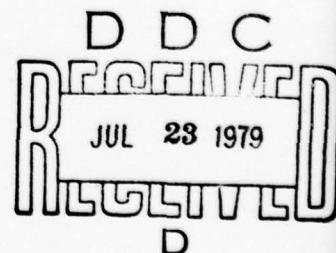
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The theoretical basis for a usage-sensitive rate structure for DCA's
ATUODIN I network is developed and applied to a simulation using
sample data to develop sample rates and to assess the possible budget-
ary effects of implementing such a structure.

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PREFACE

The appendixes in this volume are intended to provide the user with the technical information needed to reproduce the simulation program used in the analysis and to process additional samples of AUTODIN traffic. While the appendixes are complete, the user may benefit from reviewing the logical cost model as it is developed in Chapter II of Volume I.

APPENDIX B

TRAFFIC ANALYSIS
DCA SEVEN DAY SAMPLE

(Program Print-Out Facsimiles)

A U T O D I N - I   T R A F F I C   A N A L Y S I S   (7 DAY SAMPLE)

S Y S T E M   A C C E S S   A N A L Y S I S

AGENCY

	SLOW				MEDIUM				HIGH				ALL		
	NUMBER	AGENCY PERCENT	SYSTEM PERCENT	TOTAL PERCENT	NUMBER	AGENCY PERCENT	SYSTEM PERCENT	TOTAL PERCENT	NUMBER	AGENCY PERCENT	SYSTEM PERCENT	TOTAL PERCENT	NUMBER	AGENCY PERCENT	SYSTEM PERCENT	TOTAL PERCENT
D	165	99.40	18.48	12.48	1	.60	.32	.08	0	0.00	0.00	0.00	166	100.00	12.56	12.56
A	244	63.38	27.32	18.46	108	28.05	34.29	8.17	33	8.57	28.95	2.56	385	100.00	29.12	29.12
B	82	48.52	9.18	6.20	53	31.36	16.83	4.01	34	20.12	29.82	2.57	169	100.00	12.78	12.78
C	218	71.71	24.41	16.49	79	25.99	25.08	5.98	7	2.30	6.14	.53	304	100.00	23.00	23.00
E	14	77.78	1.57	1.06	3	16.67	.95	.23	1	5.56	.88	.08	18	100.00	1.36	1.36
F	31	93.94	3.47	2.34	2	6.06	.63	.15	0	0.00	0.00	0.00	33	100.00	2.50	2.50
G	0	0.00	0.00	0.00	10	33.33	3.17	.76	20	66.67	17.54	1.51	30	100.00	2.27	2.27
M	3	100.00	.34	.23	0	0.00	0.00	0.00	0	0.00	0.00	0.00	3	100.00	.23	.23
N	0	0.00	0.00	0.00	1	100.00	.32	.08	0	0.00	0.00	0.00	1	100.00	.08	.08
W	26	72.22	2.91	1.97	4	11.11	1.27	.30	6	16.67	5.26	.45	36	100.00	2.72	2.72
W	4	100.00	.45	.30	0	0.00	0.00	0.00	0	0.00	0.00	0.00	4	100.00	.30	.30
X	9	56.25	1.01	.68	7	43.75	2.22	.53	0	0.00	0.00	0.00	16	100.00	1.21	1.21
O	97	61.78	10.86	7.34	47	29.94	14.92	3.56	13	8.28	11.40	.98	157	100.00	11.88	11.88
*	893	67.55	100.00	67.55	315	23.87	100.00	23.83	114	8.62	100.00	8.62	1322	100.00	100.00	100.00

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•LINE BLOCKS•
TOTALS

AGENCY	°REGULAR TRAFFIC°				°LASH TRAFFIC°			
	LOCAL	AREA	INTER-AREA	ALL	LOCAL	AREA	INTER-AREA	ALL
D	18930464.00	657114.00	4709039.00	2920137.00	4095.00	285.00	934.00	6871.00
A	4572717.00	3488357.00	12890534.00	21151028.00	4222.00	4285.00	9078.00	10103.00
B	3734827.00	1039443.00	612478.00	1468549.00	2910.00	830.00	2102.00	9908.00
C	3758394.00	422070.00	7277992.00	15256048.00	15292.00	10179.00	23794.00	93205.00
E	2512176.00	3756154.00	33970.00	488558.00	0.00	0.00	0.00	0.00
F	2778460.00	4147.00	21225.00	53131.00	0.00	0.00	0.00	0.00
G	2057781.00	1300674.00	1000607.00	1594280.00	0.00	0.00	0.00	0.00
M	2494.00	834.00	3728.00	6914.00	0.00	0.00	0.00	0.00
N	247.00	4.00	282.00	984.00	0.00	0.00	0.00	0.00
P	266442.00	262201.00	166698.00	695551.00	330.00	0.00	215.00	2556.00
R	2042.00	506.00	16969.00	19697.00	19.00	0.00	0.00	190.00
K	202656.00	345016.00	00.00	7645762.00	127.00	191.00	54.00	1569.00
O	6850485.00	5771115.00	2520102.00	14430067.00	1203.00	0470.00	1316.00	2873.00
S	2042127.00	1782592.00	615178.00	4419430.00	999661.00	8622000.00	5017.00	11291.00

°LINE BLOCKS°
AS PERCENT OF AGENCY TRAFFIC BY CLASS

AGENCY	°REGULAR TRAFFIC°				°FLASH TRAFFIC°			
	LOCAL	AREA	INTER-AREA	ALL	LOCAL	AREA	INTER-AREA	ALL
D	40.22	23.79	35.99	100.00	86.81	6.04	7.15	100.00
A	26.35	16.49	57.16	100.00	23.25	23.48	53.27	100.00
B	26.08	15.55	58.37	100.00	49.26	14.15	36.59	100.00
C	24.63	27.66	47.70	100.00	28.71	26.62	44.67	100.00
E	25.99	34.86	35.15	100.00	0.00	0.00	0.00	0.00
F	52.26	7.80	39.94	100.00	0.00	0.00	100.00	100.00
G	25.42	8.15	66.43	100.00	0.00	0.00	0.00	0.00
H	33.99	12.09	53.92	100.00	0.00	0.00	0.00	0.00
N	29.62	0.00	70.38	100.00	0.00	0.00	0.00	0.00
P	38.34	37.70	23.96	100.00	59.78	1.65	38.77	100.00
W	10.68	2.60	86.73	100.00	100.00	0.00	0.00	100.00
X	16.67	44.75	38.59	100.00	61.82	10.91	27.27	100.00
6	27.09	38.55	34.36	100.00	30.92	26.16	42.93	100.00
*	26.33	20.74	52.93	100.00	32.09	24.37	43.54	100.00

LINE BLOCKS.
AS PERCENT OF SYSTEM TRAFFIC BY CLASS

AGENCY	REGULAR TRAFFIC				FLASH TRAFFIC			
	LOCAL	AREA	INTER-AREA	ALL	LOCAL	AREA	INTER-AREA	ALL
D	5.31	3.98	2.36	3.47	10.97	1.00	.67	4.06
A	27.02	21.47	29.17	27.01	11.43	15.28	10.30	15.77
B	13.26	16.04	14.77	13.39	7.87	2.98	4.31	5.13
C	18.22	25.98	17.56	19.48	41.38	30.53	47.48	46.28
E	1.22	2.31	.82	1.23	0.00	0.00	0.00	0.00
F	.13	.03	.05	.07	0.00	0.00	.01	.01
G	19.68	8.01	25.58	20.30	0.00	0.00	0.00	0.00
H	.01	.01	.01	.01	0.00	0.00	0.00	0.00
N	.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00
P	1.29	1.61	.40	.89	.89	.03	.43	.48
M	.01	.00	.04	.02	.05	0.00	0.00	.08
X	.98	3.35	1.33	1.55	.28	.06	.09	.14
9	12.86	23.22	8.11	12.49	27.12	30.20	27.75	28.18
*	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

AUTODIN-I TRAFFIC ANALYSIS — (7 DAY SAMPLE)

LINE BLOCKS
AS PERCENT OF TOTAL SYSTEM TRAFFIC

AGENCY	*REGULAR TRAFFIC*				*FLASH TRAFFIC*			
	LOCAL	AREA	INTER-AREA	ALL	LOCAL	AREA	INTER-AREA	ALL
D	1.40	.83	1.25	3.67	3.52	.24	.29	4.08
A	7.12	4.45	15.44	27.01	3.67	3.70	8.40	15.77
B	3.49	7.08	7.81	13.39	2.53	.73	1.08	5.13
C	4.80	5.39	9.29	19.48	13.28	12.31	20.66	46.25
E	.32	.48	.43	1.23	0.00	0.00	0.00	0.00
F	.04	.01	.03	.07	0.00	0.00	.01	.01
G	5.18	1.66	13.54	20.38	0.00	0.00	0.00	0.00
W	.00	.00	.00	.01	0.00	0.00	0.00	0.00
N	.00	0.00	0.00	.00	0.00	0.00	0.00	0.00
P	.34	.33	.21	.09	.29	.01	.19	.48
U	.00	.00	.02	.02	.02	0.00	0.00	.08
X	.26	.69	.60	1.55	.09	.02	.04	.14
G	3.38	4.82	4.29	12.49	8.70	7.36	12.68	28.15
+	26.33	26.74	52.93	100.00	32.09	26.37	43.54	100.00

AUTODIN-I TRAFFIC ANALYSIS (7 DAY SAMPLE) PAGE 6

"MESSAGES"
TOTALS

AGENCY	"REGULAR TRAFFIC"				"FLASH TRAFFIC"			
	LOCAL	AREA	INTER-AREA	ALL	LOCAL	AREA	INTER-AREA	ALL
D	92485.00	17388.00	26686.00	136559.00	858.00	19.00	36.00	913.00
A	108869.00	97183.00	252778.00	458830.00	304.00	317.00	712.00	1333.00
B	53874.00	40363.00	106453.00	200690.00	242.00	59.00	192.00	493.00
C	146093.00	147775.00	247578.00	541446.00	1305.00	1269.00	1745.00	4319.00
E	6720.00	8370.00	6932.00	22022.00	0.00	0.00	0.00	0.00
F	1928.00	328.00	1206.00	3462.00	0.00	0.00	1.00	1.00
G	69469.00	47832.00	177731.00	295032.00	0.00	0.00	0.00	0.00
H	170.00	42.00	160.00	372.00	0.00	0.00	0.00	0.00
N	39.00	0.00	54.00	93.00	0.00	0.00	0.00	0.00
P	7034.00	8172.00	5423.00	20629.00	26.00	1.00	19.00	46.00
W	206.00	49.00	368.00	623.00	7.00	0.00	0.00	7.00
X	4875.00	11468.00	9558.00	25901.00	8.00	1.00	4.00	13.00
6	69713.00	113653.00	74936.00	258302.00	732.00	449.00	945.00	2126.00
*	561475.00	492625.00	909863.00	1963963.00	3482.00	2115.00	3654.00	9251.00

"MESSAGES"
AS PERCENT OF AGENCY TRAFFIC BY CLASS

AGENCY	"REGULAR TRAFFIC"				"FLASH TRAFFIC"			
	LOCAL	AREA	INTER-AREA	ALL	LOCAL	AREA	INTER-AREA	ALL
D	67.73	12.73	19.54	100.00	93.98	2.98	3.04	100.00
A	23.73	21.18	55.09	100.00	22.81	23.78	53.01	100.00
R	26.04	20.11	53.84	100.00	49.09	11.97	38.95	100.00
C	26.98	27.29	45.73	100.00	30.22	20.38	49.40	100.00
E	36.51	34.01	31.48	100.00	0.00	0.00	0.00	0.00
F	55.69	9.47	34.84	100.00	0.00	0.00	100.00	100.00
G	23.55	16.21	60.24	100.00	0.00	0.00	0.00	0.00
M	45.70	11.29	43.01	100.00	0.00	0.00	0.00	0.00
N	41.94	0.00	58.06	100.00	0.00	0.00	0.00	0.00
P	34.10	39.61	26.29	100.00	56.52	2.17	41.31	100.00
W	33.07	7.87	59.07	100.00	100.00	0.00	0.00	100.00
X	18.02	44.28	29.77	100.00	61.54	7.69	30.77	100.00
Q	26.09	44.60	29.10	100.00	34.43	21.12	44.45	100.00
*	28.59	25.06	46.33	100.00	37.94	22.06	39.96	100.00

AUTODIN-I TRAFFIC ANALYSIS (7 DAY SAMPLE)

MESSAGES
AS PERCENT OF SYSTEM TRAFFIC BY CLASS

AGENCY	REGULAR TRAFFIC LOCAL	AREA INTER-AREA	ALL	FLASH TRAFFIC LOCAL	AREA INTER-AREA	ALL
D	16.67	2.93	6.95	24.64	.00	9.07
A	19.39	27.78	23.36	8.73	14.99	14.41
B	9.60	11.70	10.22	6.95	2.79	5.25
C	26.02	27.21	27.57	37.48	60.00	48.08
E	1.20	.76	1.12	0.00	0.00	0.00
F	.34	.13	.18	0.00	0.00	.01
G	12.37	19.53	15.02	0.00	0.00	0.00
H	.03	.02	.02	0.00	0.00	0.00
N	.01	.01	.00	0.00	0.00	0.00
P	1.25	.60	1.05	.75	.05	.38
W	.04	.04	.03	.28	0.00	0.00
X	1.87	1.05	1.32	.23	.05	.11
G	12.42	8.24	13.15	21.02	21.23	22.06
*	100.00	100.00	100.00	100.00	100.00	100.00

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°M E S S A G E S°
AS PERCENT OF TOTAL SYSTEM TRAFFIC

AGENCY	°R E G U L A R T R A F F I C°				°F L A S H T R A F F I C°			
	LOCAL	AREA	INTER-AREA	ALL	LOCAL	AREA	INTER-AREA	ALL
D	4.71	.09	1.36	6.95	9.27	.21	.39	9.87
A	5.54	4.95	12.87	23.36	3.29	3.43	7.78	14.41
B	2.74	2.06	5.42	10.22	2.62	.64	2.08	5.33
C	7.44	7.52	12.61	27.57	14.11	13.72	10.84	68.69
E	.34	.43	.35	1.12	0.00	0.00	0.00	0.00
F	.10	.02	.06	.18	0.00	0.00	.01	.01
G	7.54	7.44	9.05	15.02	0.00	0.00	0.00	0.00
H	.01	.00	.01	.02	0.00	0.00	0.00	0.00
N	.00	0.00	.00	.00	0.00	0.00	0.00	0.00
P	.36	.42	.28	1.05	.28	.01	.21	.50
W	.01	.00	.02	.03	.08	0.00	0.00	.08
X	.25	.58	.49	1.32	.00	.61	.64	.76
O	3.85	5.79	3.82	13.15	7.91	4.85	10.22	22.98
*	28.59	25.08	46.33	100.00	37.64	22.22	30.50	100.00

LINE BLOCKS PER MESSAGE

AGENCY	REGULAR TRAFFIC				FLASH TRAFFIC			
	LOCAL	AREA	INTER-AREA	ALL	LOCAL	AREA	INTER-AREA	ALL
O	11.83	37.22	36.69	19.92	4.73	14.04	9.28	5.12
A	51.19	34.89	47.43	46.18	13.89	13.45	13.50	13.63
B	56.76	40.39	57.49	52.25	12.02	14.17	11.26	11.98
C	25.73	28.56	29.40	28.18	11.72	11.17	13.64	12.33
E	37.38	44.88	49.61	43.80	0.00	0.00	0.00	0.00
F	16.40	12.63	17.60	15.35	0.00	6.00	6.00	6.00
G	58.41	27.19	59.67	54.11	0.00	0.00	0.00	0.00
M	13.82	19.90	23.30	18.50	0.00	0.00	0.00	0.00
N	7.36	8.00	12.63	10.42	0.00	0.00	0.00	0.00
P	37.91	32.09	30.73	33.72	12.60	0.00	11.26	12.00
W	10.11	16.33	45.95	21.30	2.71	0.00	0.00	2.71
X	41.57	47.44	49.08	46.04	12.75	18.00	11.88	12.60
6	38.03	33.19	44.86	47.08	13.69	10.07	16.73	15.28
*	36.73	32.98	45.56	39.88	10.61	13.27	13.72	12.48

INPUT PARAMETERS

COSTS ($/YR)

SWITCH	43944160
CONUS TRUNKS	355992
OVRSEAS TRUNKS	1781988
TOTAL	46082140

ADU MEMORY 8788832
(ALPHA) (0.20)

TECHNICAL FACTORS

AREA MEMORY
   CAPACITY 21060
AREA TRUNK
   TERMINATIONS 56
INTER-AREA
   TERMINATIONS 17

USAGE COST FACTORS

LINE BLOCKS	1.000
MESSAGES	0.000
FLASH WEIGHTS	0.000

SURCHARGES ($/UNIT)

	LOCAL	AREA	INTER
ALL	0.10	0.15	0.30
FLASH	0.00	0.00	0.00

VOLUME OF TRAFFIC

LBLKS	MSGS	LBLK/MSG
78319983	1963961	39

VOLUME OF FLASH TRAFFIC

LBLKS	MSGS	LBLK/MSG
115162	9251	12

SAMPLE CHARACTERISTICS

NUMBER OF CONNECTIONS

SLOW	MED	HIGH	TOTAL
893	315	114	1322

DAYS OF TRAFFIC
7

TYPE OF TRAFFIC

	LOCAL	AREA	INTER-AREA
LBLKS	20621427	16246368	41522188
	561475	492623	909863

RATE ANALYSIS

ACCESS CHARGES ($/MO)

BASE CHARGE	93.01
SLOW SPEED	279.04
MED SPEED	837.11
HIGH SPEED	1302.17

UTILIZATION RATES ($/UNIT)

	LOCAL	AREA	INTER AREA
LBLKS	0.0035	0.0038	0.0047
MESSAGES	0.1000	0.1500	0.3000
WEIGHTS	1.0000	1.0000	1.0000

COST ALLOCATION ($/YR)

UTILIZATION	38146317
CONNECTIVITY	7935823
TOTAL	46082140

IDA AUTODIN COST ALLOCATION MODEL OUTPUT
(ANNUAL BASIS)

BACKBONE CHARGES BY AGENCY

	AGENCY CHARGES			PERCENT BREAKDOWN (WITHIN AGENCY)		CHARGES AS PERCENT OF TOTAL		
AGENCY	UTILZATN	CONNEC	TOTAL	UTILZATN	CONNEC	UTILZATN	CONNEC	TOTAL
D	1601263	562539	2163803	.74	.26	4.20	7.09	4.70
A	9952754	2417580	12370334	.80	.20	26.09	30.46	26.84
B	4584868	1338263	5923131	.77	.23	12.02	16.86	12.85
C	9089719	1632927	10722646	.85	.15	23.83	20.58	23.27
E	412359	92640	504999	.82	.18	1.08	1.17	1.10
F	42488	123893	166381	.26	.74	.11	1.56	.36
G	7116152	412975	7529128	.95	.05	18.65	5.20	16.34
M	5219	10045	15264	.34	.66	.01	.13	.03
N	1265	10045	11311	.11	.89	.00	.13	.02
P	326493	220998	547491	.60	.40	.86	2.78	1.19
W	11842	13394	25236	.47	.53	.03	.17	.05
X	524476	100453	624930	.84	.16	1.37	1.27	1.36
6	4477417	1000070	5477487	.82	.18	11.74	12.60	11.89
TOTAL	38146317	7935823	46082140	.83	.17	100.00	100.00	100.00

IDA AUTODIN COST ALLOCATION MODEL OUTPUT (concluded)
(ANNUAL BASIS)

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APPENDIX C

SIMULATION PROGRAM DOCUMENTATION

SIMULATION PROGRAM DOCUMENTATION

The IDADIN computer model, the IDA version of the DCA
automated AUTODIN Costing Model, consists of two Fortran pro-
grams on cards and various data files residing on both cards
and tape. Described in this appendix are (1) the coding scheme
and processing sequence for model operation, (2) the structure
and programming logic of the Fortran routines, and (3) the for-
mats of the various data files and user-defined input parameters.
Sample output and listings of the Fortran programs DNCOSTCD and
IDADIN are included.

A.   CODING SCHEME FOR MODEL OPERATION

The DCA AUTODIN I system is a computer-controlled "store
and forward" digital communications network that receives,
stores, and transmits data to predetermined addresses on a
worldwide basis. The 17 interconnected store-and-forward sta-
tions (computers) in the network are referred to as AUTODIN
Switching Centers (ASCs) or, for convenience, "switches."
Authorized users access the system from terminals or computers
by means of circuits or channels continuously connecting them
to a particular ASC. Each connection, a unique channel-switch
combination is referred to as a system tributary and, depending
on the speed of the transmitting equipment used, is classified
as slow (transmits at 75, 150, or 300 baud), medium (600-1200
baud) or high (2400-4800 baud). Because of these varying trans-
mission speeds, the Central Processing Unit (CPU) of each
switch is augmented by the additional memory capacity of the
Accumulation and Distribution Unit (ADU) which (1) stores

incoming messages until the CPU can handle them, and (2) matches
the output rate to that of the receiving equipment. The follow-
ing codes, based on the features of the AUTODIN network just
described, are associated with each AUTODIN message transmission
for cost accounting purposes.

>   (1) Program Designator Code (PDC). A four-character alpha-
>   numeric code consisting of the subscriber agency code
>   (initial character) and the program-within-agency code
>   (remaining three characters). Currently, there are
>   1300 subscribers accounting for 150 programs of 13 user
>   agencies.
>
>   (2) Tributary Code. A combined code consisting of a three-
>   character alphanumeric originating switch name and a
>   three-character alphanumeric originating channel name
>   (currently 1300 access lines among 17 switches).
>
>   (3) Routing Indicator (RI) Code. A six-character alpha-
>   numeric code that identifies either the origin or des-
>   tination circuit/terminal for the message transmission.
>   This code is available but not used in IDADIN process-
>   ing.
>
>   (4) Values for weighting ADU memory costs by speed class
>   of access line. Weights of 3, 9, and 14 are used for
>   low, medium, and high connections, respectively.

B.   PROCESSING SEQUENCE FOR MODEL OPERATION

A schematic of the overall processing sequence for the IDA-
DIN model is shown in Figure C-1. Data for AUTODIN traffic are
collected over all the ASCs in "traffic files," each file (a
"raday") representing one day's traffic. The traffic files and
the AMIE Extract File are first sequenced by utility sort for
input to the preliminary program DNCOSTCD. During this procedure
the records of the Traffic File simultaneously are reduced in
length to seven elements of information, sequenced in ascending
order of originating switch name, originating channel name, and
RI code, and, if more than one file, merged into a single file.
Then, by matching the sequenced Traffic File to both the se-
quenced AMIE Extract File and the Switch Name File, DNCOSTCD
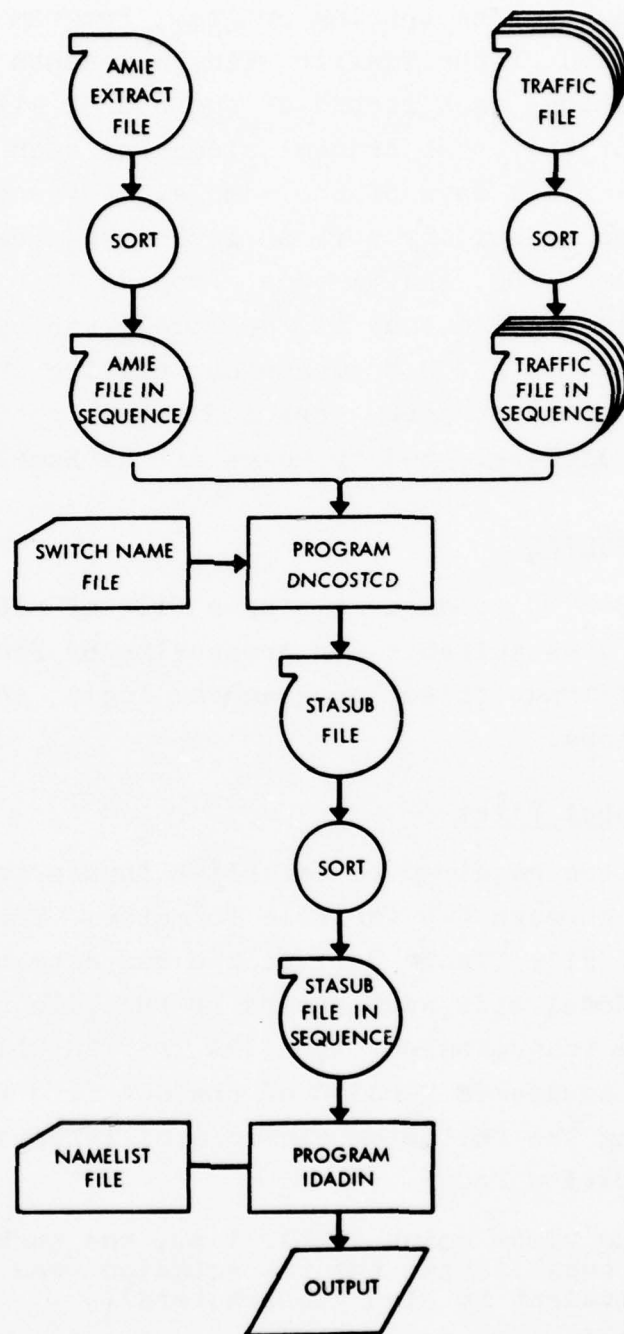produces as output the STASUB File, a revised traffic file

Figure C-1.   SCHEMATIC OF PROCESSING SEQUENCE
FOR THE IDADIN COSTING MODEL

suitable for input to the costing program, Program IDADIN.
Whereas each record of the Traffic File represents a single
message transmission, each record of the STASUB File represents
an aggregation of the total transmissions for each tributary
on the system over all days of the sample. After the STASUB
File is sequenced by utility sort in ascending order of switch
name, channel name, PDC, and RI code, Program IDADIN processes
it to produce, as final output of the model, various costing
analyses pertinent to AUTODIN subscriber billing charges. As
will be described, input parameters and output options for Pro-
gram IDADIN are user-selected by means of the Namelist File.

C.   PROGRAM DNCOSTCD

Program DNCOSTCD produces a single file of subscriber-coded
AUTODIN traffic data suitable for processing by Program IDADIN.
A description of input files, programming logic, and DNCOSTCD
subprograms follows.

1.   DNCOSTCD Input Files

Four files are required to establish inputs to DNCOSTCD
(see Tables C-1 through C-4 for file formats). The DCA Sorted
Assemble Traffic File (Table C-1) is the raw data base for the
IDADIN Costing Model with each record of the file representing
a single message transmission. The IDA Traffic File (Table C-2)
is a sequenced, condensed version of the DCA file with each
record containing the following elements of information relevant
to the IDADIN Costing Model:

   (1) The line block count (LBC), i.e., the number of line
       blocks constituting the transmission (one line block
       is equivalent to eighty characters).
   (2) The originating switch and channel names (the origin
       tributary).
   (3) The destination switch and channel names (destination
       tributary).
   (4) The message precedence (priority).

Table C-1. FILE FORMAT FOR DCA SORTED ASSEMBLE TRAFFIC FILE

Field	Record Position	Fortran Variable Name	Format	Item
1	1-3	W(1)	A3	Raday (not used)
2	4	W(2)	A1	Precedence (Z = FLASH)
3	5	W(3)	A1	Security (not used)
4	6	W(4)	A1	LMF (not used)
5	7-9	W(5)	A3	Origin Switch Name
6	10-12	W(6)	A3	Origin Channel Name
7	13-15	W(7)	A3	Dest. Switch Name
8	16-18	W(8)	A3	Dest. Channel Name
9	19-22	W(9)	A4	OSSN (not used)
10	23-25	W(10)	I3	Line Block Count
11	26-29	W(11)	I4	Time of Transmission (not used)
12	30-33	W(12)	A4	Speed of Service (not used)
13	34-39	W(13)	A6	Origin RI

File Name: Sorted Assemble Traffic File (Tape Input)
Source: Defense Communications Agency

Table C-2. FILE FORMAT FOR IDA TRAFFIC FILE

Field	Record Position	Fortran Variable Name	Format	Item
1	1-3	W(1)	A3	Destination Channel Name
2	4	W(2)	A1	Precedence (Z = FLASH)
3	5-7	W(3)	A3	Origin Switch Name
4	8-10	W(4)	A3	Origin Channel Name
5	11-13	W(5)	A3	Destination Switch Name
6	14-16	W(6)	I3	Line Block Count
7	17-22	W(7)	A6	Origin RI

File Name: IDA Traffic File
Fortran Reference: TAPE 1 (Tape Input)
Source: Institute for Defense Analyses

The AMIE Extract File, Table C-3, a condensed version of the
DCA Auditing Management Index File (AMIE), contains a list of
PDCs and bauds (transmission speeds) associated with each tribu-
tary appearing on the Traffic File. These two files are matched
on tributaries, i.e., on switch name/channel name combinations.
Similarly, the Switch Name File, Table C-4, contains a geo-
graphic location code (C = CONUS, E = Europe, P = Pacific) for
each of the 17 switches on the AUTODIN system. This file is
matched to the Traffic File by switch name.

Table C-3. FILE FORMAT FOR AMIE EXTRACT FILE

Field	Record Position	Fortran Variable Name	Format	Item
1	1-3	AMIE(1)	A3	Origin Switch Name
2	4-6	AMIE(2)	A3	Origin Channel Name
3	7-10	AMIE(3)	A4	PDC
4	11-14	AMIE(4)	A4	Baud Rate

File Name: AMIE Extract File
Source: Defense Communications Agency
Fortran Reference: TAPE 1 (Tape Input)

Table C-4. FILE FORMAT FOR SWITCH NAME FILE

Field	Card Column	Fortran Variable Name	Format	Item
1	1-3	J	A3	Switch Name
2	4	K	A1	Geographical Area

File Name: Switch Name File
Fortran Reference: TAPE 5 (Card Input)

2.   DNCOSTCD Programming Logic

By sequential matching of the ordered records of the input files described above, Program DNCOSTCD both revises and aggregates the records of the IDA Traffic File in the following four ways. (1) The baud and PDC from an AMIE Extract File record and the origin switch name, origin channel name, and RI from a matching Traffic File record form the first five fields of the revised record. (2) The originating switch name and geographic location of the transmission are compared to the destination switch name and geographic location. If the originating and destination switch names match, the LBC for the record is designated local traffic and if the message has priority (a "FLASH" message) the LBC is also designated as local FLASH data. Similarly, if only the geographic areas match, the LBC is designated as area traffic or FLASH area traffic. If neither switch nor geographic areas match, the LBC is designated inter-area or FLASH inter-area. Thus, the LBC for a given transmission is assigned one of the next six fields on the new record according to its geographic designation and precedence category. (It should be noted that the count of FLASH LBCs on any record is to be considered a subset of the total LBC count.) (3) A new traffic record is read. If the origin switch name/channel name combination contained on the record does not match that on the AMIE Extract record just processed, a new AMIE record is read (thus effecting the next match) and a new tributary record is constructed as described. If the next tributary does match the preceding AMIE record, however, the LBC counts are added into the counts just established for the preceding match. (4) Finally, the remaining six fields of the tributary record are used to record the number of message transmissions occurring for the tributary. The counts are incremented with each match of a traffic record to a preceding AMIE record, and their placement on the record corresponds to the geographic designation-precedence categories used for the LBC counts with the exception

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that an additional field is used to tally total number of messages for the tributary.

A more specific description of this processing sequence is shown in the flow chart in Figure C-2. Additional information is provided by means of comment cards on the DNCOSTCD Program Listing.

3. DNCOSTCD Subprograms

Two short subroutines are used in DNCOSTCD processing. Subroutine SORT is called to sort the input switch name location codes into collating sequence. The Integer Function Subprogram LOC is called in order to match both switch names on a given record with the sorted switch name file, thus allocating LBCs to the proper record field. In addition to SORT and LOC, DNCOSTCD also uses two input file detection devices resident in the IDA CDC computer system program library. INCK allows a return to execution if illegal characters are encountered during a Fortran BCD input read rather than terminating the program with an error message. The EOF device is used to detect the end-of-file mark on the various input files and to branch program control to the appropriate point in the processing sequence.

4. DNCOSTCD Sample Output

Two types of printed output are produced in DNCOSTCD processing. Table C-5 shows a listing of the 17 switch name codes in the Switch Name File and their corresponding geographic identifiers. Table C-6 shows a formatted listing of the contents of the STASUB File produced as the primary output of the program.

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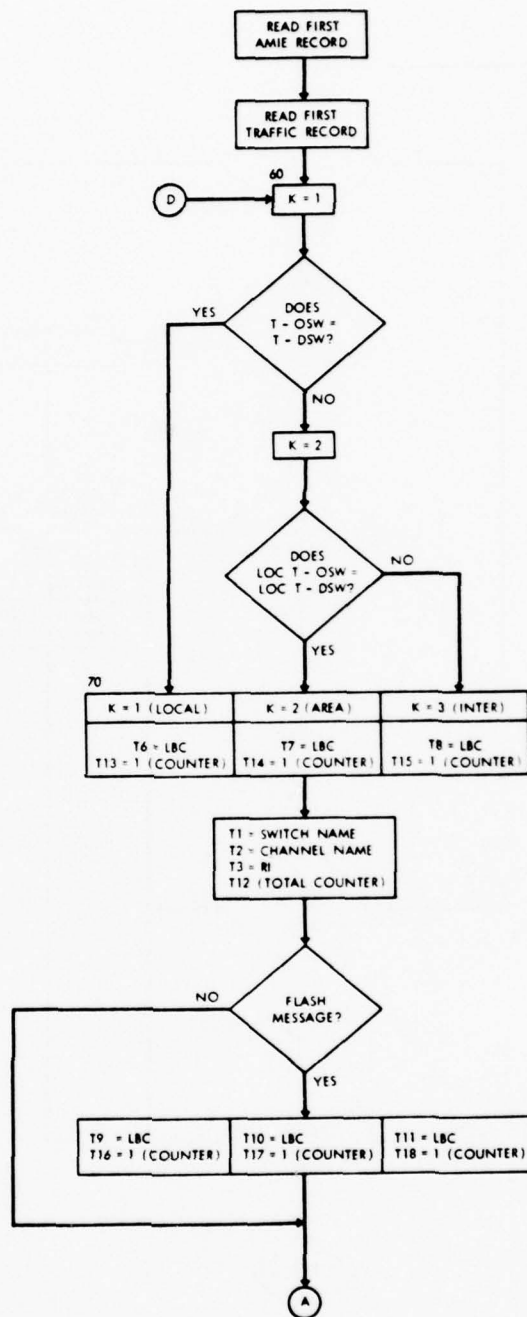
Figure C-2. PROCESSING SEQUENCE FOR PROGRAM DNCOSTCD
(continued on next page)

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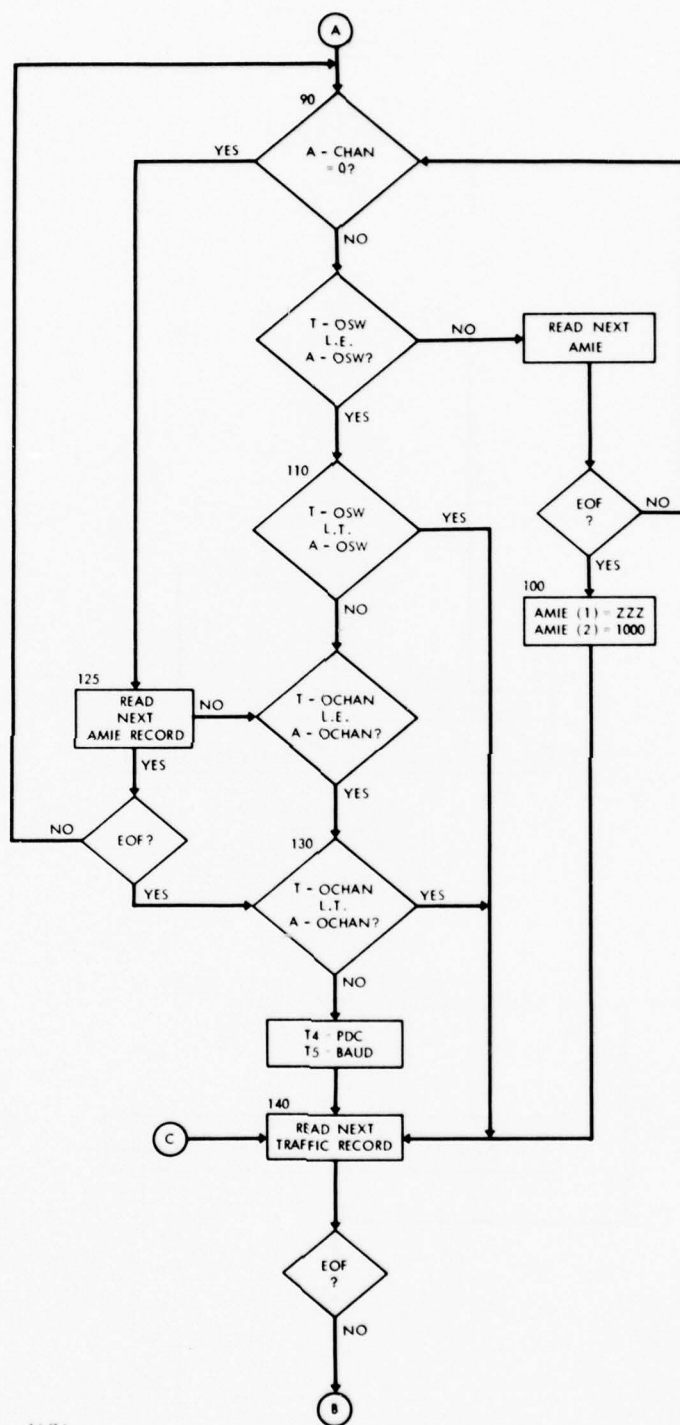
Figure C-2 (continued)

C-10
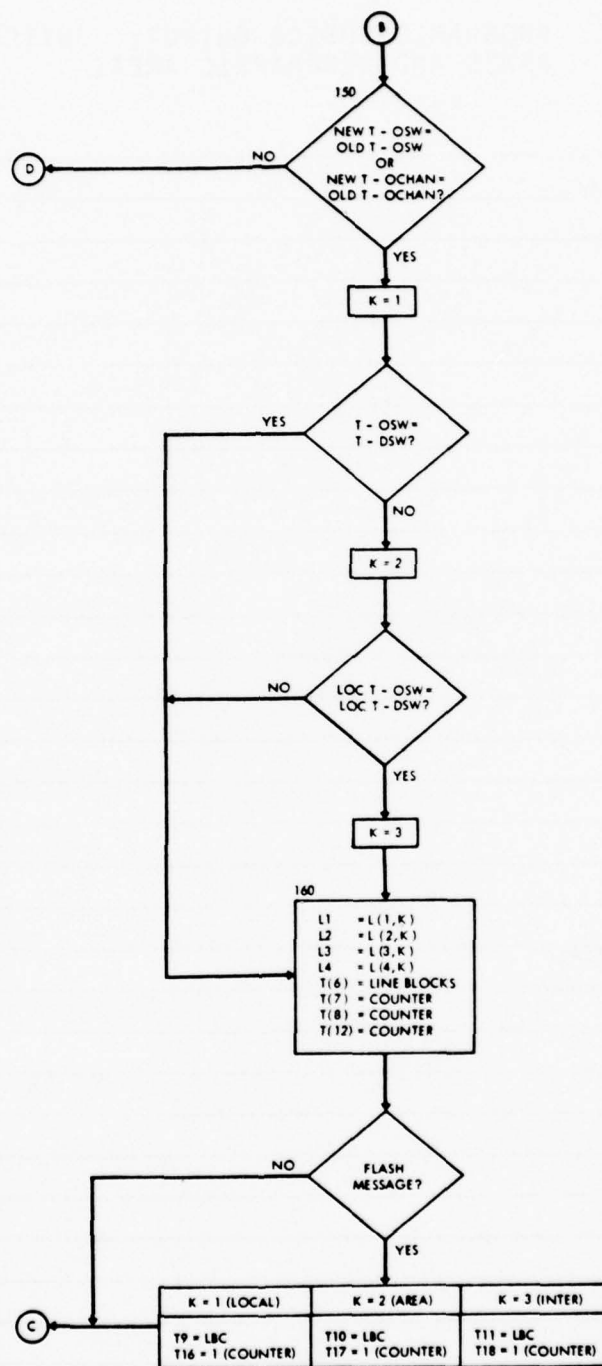
Figure C-2 (concluded)

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Table C-5.   PROGRAM DNCOSTCD OUTPUT: SWITCH
NAMES AND GEOGRAPHIC AREAS

SWITCH DESIGNATIONS ARE

UAD   P

UAK   P

UAO   P

UCI   C

UCL   C

UDO   E

UEB   C

UED   C

UEO   C

UFL   E

UFT   E

UHH   P

UHJ   P

UHM   P

UWJ   C

UWM   C

UWT   C

RETURN FROM INPUT ERROR.

Table C-6. PROGRAM DNCOSTCD OUTPUT: FORMATTED LISTING OF THE STASUB FILE

T1/T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18

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C.   PROGRAM IDADIN

The purpose of the IDADIN computer model is to provide a
method of allocating costs to the particular users having access
to the AUTODIN system. Using a sample of message traffic, Pro-
gram IDADIN performs a rate analysis and calculates backbone
charges by user agency. In addition, various tables of possible
cost allocations are generated. A description of the IDADIN
input files, programming logic, cost model algorithm, and sub-
programs follows. Sample output is included.

1.   IDADIN Input Files

Two files are required inputs to Program IDADIN. The STA-
SUB File (see Table C-7 for file format) contains for each trib-
utary on the system its user identification codes (PDC and origin
switch and channel names), transmission speed (baud), and volume
of traffic (line block and message counts) over all days of the
traffic sample. The second file is input on cards and stored
as array LIST by means of the Fortran Namelist statement. This
technique is employed in Program IDADIN to enable the user to
vary cost allocation model input parameters and to select out-
put options for each iteration of the cost algorithm. The array
LIST is established by the user in the following manner. A
value is selected for each variable specified by the Namelist
statement (see Table C-8). The variable names and values are
then punched on input cards in "free format," i.e., they are
punched in the order specified by the Namelist statement but
without regard to the field position. (Similarly, when the
list is input or output, no format specifications are required.)
Each input list must begin with a $ in Column 2 of the first
card, followed immediately by the word LIST with no embedded
blanks. A $ must also follow the last variable in the list.
The data items, separated by commas, may be in any of three
forms:

Table C-7. FILE FORMAT FOR STASUB FILE

Field	Record Position	Fortran Variable Name	Format	Item
1	1-3	W(1)	A3	Originating Switch Name
2	4-6	W(2)	A3	Originating Channel Name
3	7-12	W(3)	A6	Routing Indicator Code
4	13-16	W(4)	A4	Program Designator Code
5	17-20	W(5)	I4	Transmission, Speed, baud
6	21-29	W(6)	I9	Number of Local Line Blocks
7	30-38	W(7)	I9	Number of Area Line Blocks
8	39-47	W(8)	I9	Number of Inter-area Line Blocks
9	48-53	W(9)	I6	Number of Local FLASH Line Blocks
10	54-59	W(10)	I6	Number of Area FLASH Line Blocks
11	60-65	W(11)	I6	Number of Inter-area FLASH Line Blocks
12	66-72	--	--	Blank
13	73-80	W(12)	I8	Total Number of Messages
14	81-89	W(13)	I9	Number of Local Messages
15	90-98	W(14)	I9	Number of Area Messages
16	99-107	W(15)	I9	Number of Inter-area Messages
17	108-116	W(16)	I9	Number of Local FLASH Messages
18	117-125	W(17)	I9	Number of Area FLASH Messages
19	126-134	W(18)	I9	Number of Inter-area FLASH Messages

File Name: STASUB File

Fortran Reference: TAPE 1 (Tape Input)

Table C-8.   NAMELIST FILE INPUT VARIABLES

Variable Name	Output Item	Value Producing Sample Output[1]	Definition
SWCOST	Switch Cost, $	845080	This value x 52 is the approximate lease and O&M costs for all switching centers in FY 78.
MCOST	ADU Memory Cost, $	169016	This value x 52 is the estimate of ADU lease costs. Nine leased switches assuming two ADUs per switch.
TRKC	Number of Area Trunk Terminations	56	Count of leased switch interconnections.
TRKI	Number of Inter-area Terminations	17	Number of trunk terminations at leased switches from overseas.
TRIC	CONUS Trunk Costs, $	6846	Defined as cost of all area trunks, i.e., trunks connecting switches in same charging area (CONUS, Europe, etc.). Value here x 52 is for CONUS trunks only.
TROC	Overseas Trunk Costs, $	34269	Defined as cost of trunks connecting switches in different areas. Value used here is for CONUS trunks only.
LBLKS	Area Memory Capacity, Line Blocks	21060	Line blocks of ADU memory is all leased switches assuming eighteen ADUs and eight quadrants of memory per ADU (Hawaii switch is included with CONUS).
BRKDWN	n.a.	.TRUE.	Output Control Variable. If BRKDWN = .TRUE., output produced for AUTODIN Costs by Program Designation Code for utilization, connectivity, and total costs. If BRKDWN = .FALSE., output suppressed.
SPDBLK	Not shown in output	3, 9, 14	Weights (slow, medium, high) used to calculate monthly basic charge for connectivity.
FLASH	Usage Cost Factor: FLASH Weights	0.0	Single weight applied to all FLASH messages (may take on any value).
BLOCKS	Usage Cost Factor (if line blocks, 1.0; if messages, 0.0)		A 0.0 value for BLOCKS is equivalent to assigning all usage charges on a message basis. A 1.0 value assigns all message charges on a line block basis. Calculated after all surcharges have been deducted. Values may range between 0 and 1.
MSGCHG	Surcharges: local, area, inter-area	.10, .15, .30 (0.0 for FLASH)	These surcharges are applied on a per-message basis and subtracted from costs to be collected through usage before calculation of line block and message rates. May take on any value.
MSGWTS	Not shown	1, 1, 1	A set of weighting factors for local, area, and inter-area non-FLASH messages. May take on any value.
PRTTA	n.a.	.TRUE.	Output Control Variable. If PRTTA = .TRUE., output produced for subroutines CNCT and ATA. If PRTTA = .FALSE., output suppressed.

[1]See IDA AUTODIN Cost Allocation Model Output.

$$v = c$$
$$a = d_1, \ldots, d_j$$
$$a(n) = d_1, \ldots, d_m$$

where v is a variable name, c a constant, a an array name, and n an integer subscript. The d_i are simple constants or repeated constants of the form k*c, where k is the repetition factor. For example, $ SWCOST = 845080, MCOST = 169016, TRKC = 56,..., PRTTA = .TRUE.$. A special feature of the use of the Namelist in IDADIN is that those variables shown in Table C-8 as already containing values are used as default inputs. To use them by default, the user merely omits them from his input list. An additional feature is that the output from Subroutines CNNCT and ATA can be suppressed by resetting the logical variable PRETTA to .FALSE.. Similarly, the output for AUTODIN I costs by program designator code can be suppressed by setting the logical variable BRKDWN to .FALSE..

2. IDADIN Processing Sequence

Program IDADIN processing proceeds as follows: (1) the Namelist File is read in, thus setting up array LIST with an ordered list of model parameters. (2) Subroutine Sample is called to place into the labeled common block PCA an alpha-numeric representation of the number of days (IOPT) in the traffic sample. This provides a convenient way to display the sample size in all the output headers. (3) Next, if the user has not suppressed them by means of the input control variable PRTTA, two subroutines are called: Subroutine CNNCT calculates and outputs a breakdown of total ADU memory utilization by switch and connectivity speed class (see Table C-9). Subroutine ATA is called to calculate an AUTODIN I Traffic Analysis (7-day sample). The output of this analysis (see Appendix B) is organized in the following manner. The first table, "System Access Analysis," presents by agency the number of connections

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Table C-9.   PROGRAM IDADIN OUTPUT: ADU MEMORY
UTILIZATION, LINE BLOCKS, BY SWITCH
AND CONNECTIVITY SPEED CLASS

Switch	Slow	Medium	High	Percent
UEB	79	21	8	46
UED	51	19	17	49
UEO	61	24	18	56
UCI	47	20	13	43
UCL	57	37	10	56
UWJ	47	24	8	41
UWM	73	29	6	49
UWT	77	33	17	66
UHH	39	12	3	23

by speed class and the percent each value is of the agency, the
system, and the total.   The next nine tables are a breakdown
by agency for local, area, inter-area, and total traffic (both
regular and FLASH) for the following items:

(a) total line blocks
(b) line blocks as percent of agency traffic
(c) line blocks as percent of system traffic
(d) line blocks as percent of total system traffic
(e) total messages
(f) messages as percent of agency traffic
(g) messages as percent of system traffic
(h) messages as percent of total system traffic
(i) line blocks per message.

The remaining table (see sample in Table C-10) is a summary of
all the preceding tables by PDC code rather than by agency.
(4) Using the parameters specified in the Namelist File, all
cost factors are calculated.   Then, Subroutine TAB is called
to print the report of the resulting cost allocation by Program
Designator Code (see Table C-11).   (5) Subroutine OUTPUT is

Table C-10. PROGRAM IDADIN OUTPUT: TRAFFIC ANALYSIS SUMMARY TABLE BY PDC CODE

PROGRAM DESIGNATOR CODE	REGULAR TRAFFIC				FLASH TRAFFIC				CONNECTIONS			
	LINE BLOCKS MESSAGES				LINE BLOCKS MESSAGES							
	LINE BLOCKS PER MESSAGE				LINE BLOCKS PER MESSAGE							
	LOCAL	AREA	INTER	ALL	LOCAL	AREA	INTER	ALL	SLOW	MEDIUM	HIGH	ALL
AAAI	1003984	647114	979039	2726137	4055	282	334	4671				
	92685	17388	26686	136559	858	19	36	913	165	1	0	166
	12	37	37	20	5	15	9	5				
AAA1	100	0	0	100	0	0	0	0				
	10	0	0	10	0	0	0	0	1	0	0	1
	10	0	0	10	0	0	0	0				
AAA1	5336	4933	6971	17240	132	90	221	443				
	487	297	347	1131	10	6	15	31	6	0	0	6
	11	17	20	15	15	15	15	15				
AAA2	43191	140067	88000	271238	553	1040	1315	2908				
	2128	6247	3754	12129	43	75	100	218	5	2	0	7
	20	22	23	22	13	14	13	13				
AAFB	80	40	152	281	0	0	0	0				
	16	6	14	36	0	8	8	0	1	0	0	1
	5	8	11	8	0	0	0	0				
AAFD	40087	98560	113217	251864	210	254	418	882				
	1820	3386	3810	9016	18	22	36	76	3	3	0	6
	22	29	30	28	12	12	12	12				
AAFE	10055	2702	18487	31244	0	0	0	0				
	583	83	683	1269	0	0	0	0	8	2	0	10
	20	33	27	25	0	0	0	0				
AAFF	260	71	167	427	0	0	0	0				
	50	7	12	69	0	0	0	0	1	0	0	1
	4	10	12	6	0	0	0	0				
AAFI	830	4	3677	4510	0	0	0	0				
	114	6	84	203	0	0	0	0	1	0	0	1
	7	6	44	22	0	0	0	0				
AAFL	278	251	352	881	0	0	0	0				
	67	20	33	129	0	0	0	0	1	0	0	1
	4	13	11		0	0	0	0				

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Table C-11. PROGRAM IDADIN OUTPUT: SUMMARY OF AUTODIN I COSTS FOR
UTILIZATION AND CONNECTIVITY BY PROGRAM DESIGNATOR CODE

A U T O D I N - I   T R A F F I C   A N A L Y S I S   (7 DAY SAMPLE)

AUTODIN-I COSTS BY PROGRAM DESIGNATOR CODE

called to organize the first portion of a convenient summary of the cost allocation model in terms of the input parameters specified by the user, sample characteristics, and the rate analysis. (6) Control is returned to the main program to calculate and print out, as the final portion of the summary, the backbone charges by agency. (7) The final section of the program rewinds the STASUB File and processes and prints out the second user output option if specified, i.e., a full analysis by switch for each PDC (see Table C-12 for sample). At this point, a new namelist card(s), if any, is read in and processing starts again for another full run of the program. A more detailed description of the cost allocation model algorithm is described in the following section.

3. Cost Model Allocation Algorithm

The IDA AUTODIN Cost Allocation Model (see Table C-13 for sample results) disaggregates the network according to hardware and message traffic characteristics in order to produce an algorithm for charging agencies for use of the system. Factors such as the number of switches and trunks, the area switch memory capacity, the type (speed) of connectivity into the backbone, the speed and destination of messages, and the total message volume all affect the allocation of AUTODIN backbone cost. A formula using these factors breaks down the total system charges and assigns them to agencies. The formula is

$$T_i = \sum_{j=1}^{3} w_j N_j + A_1(x_i + y_i + z_i) + A_2(y_i + z_i) + A_3(z_i) + A_4 F_i$$

where

T_i = total PDC charges according to transmission unit
j = baud category
N_j = number of access lines of speed j
w_j = weighted connectivity charge of speed j

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Table C-12. PROGRAM IDADIN OUTPUT: UTILIZATION AND CONNEC-
TIVITY COSTS FOR SWITCH BY TRIBUTARY (PART 1)
AND FOR PDC BY SWITCH AND TRIBUTARY (PART 2)

PART 1

TRIBUTARY	UTILIZATION	CONNECTIVITY	TOTAL
UAD018	467.60	53.73	521.32
UAD039	.37	53.73	54.09
UAD042	30.06	53.73	83.78
UAD082	613.98	53.73	667.71
UAD103	130.63	53.73	184.35
UAD110	4.39	53.73	58.16
UAD124	44.11	53.73	97.83
UAD130	360.24	53.73	413.97
UAD136	47.02	53.73	100.75
UAD137	17.42	53.73	71.15
UAD154	423.55	53.73	477.28
UAD168	.37	53.73	54.09
UAD224	499.26	53.73	552.99
UAD225	3.06	53.73	56.79
UAD226	13.99	53.73	67.72
SASC...UAD	2656.09	805.89	3461.94
UAK021	54.89	53.73	108.61
UAK040	371.46	53.73	425.19
UAK044	22.46	53.73	76.18
UAK053	181.64	53.73	235.37
UAK091	442.95	53.73	496.67
UAK224	393.47	53.73	447.20
UAK225	1.46	53.73	55.19
UAK226	24.03	53.73	77.79
SASC...UAK	1492.36	429.81	1922.17
UAN018	20.38	53.73	74.11
UAN039	858.54	53.73	912.37
UAN054	143.80	53.73	197.52
UAN060	233.51	53.73	287.24
UAN077	664.18	53.73	717.90
UAN084	.37	53.73	54.09
UAN097	1.46	53.73	55.19
UAN107	46.52	53.73	100.24
UAN109	.37	53.73	54.09
UAN224	537.71	53.73	591.44
UAN225	.73	53.73	54.46
UAN226	19.29	53.73	73.02
SASC...UAN	2526.97	644.71	3171.68
UCI SVM	485.48	53.73	539.21
UCI062	348.13	53.73	401.85
UCI118	7.09	53.73	60.81
UCI195	7.26	53.73	60.98
SASC...UCI	847.95	214.90	1062.86
UCL SVM	647.96	53.73	701.68
UCL007	8.78	53.73	62.51
UCL180	10.75	53.73	64.47

(continued on next page)

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Table C-12 (concluded)

PART 2

TRIBUTARY	UTILIZATION	CONNECTIVITY	TOTAL
SPDC...	52466.86	9025.94	61492.80
UWM122	3.66	53.73	57.38
SASC...UWM	3.66	53.73	57.38
SPDC...AAA1	3.66	53.73	57.38
UAD134	56.09	53.73	109.81
SASC...UAD	56.09	53.73	109.81
UAK08A	176.24	53.73	229.96
SASC...UAK	176.24	53.73	229.96
UA0052	7.50	53.73	61.22
UA0103	118.95	53.73	172.67
SASC...UA0	126.44	107.45	233.89
UMM175	70.38	53.73	124.11
SASC...UMM	70.38	53.73	124.11
UMM047	26.82	53.73	80.55
SASC...UMM	26.82	53.73	80.55
SPDC...AAA1	455.97	322.36	778.32
UAD079	1838.25	161.18	1999.43
UAD135	606.65	53.73	660.37
SASC...UAD	2444.90	214.90	2659.80
UAK057	160.40	161.18	321.58
SASC...UAK	160.40	161.18	321.58
UA0010	1427.36	53.73	1481.09
UA0106	279.20	53.73	332.93
SASC...UA0	1706.56	107.45	1814.02
UMM076	189.61	53.73	243.34
UMM106	411.01	53.73	464.73

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Table C-13. PROGRAM IDADIN OUTPUT: COST ALLOCATION MODEL SUMMARY

A U T O D I N - 1   T R A F F I C   A N A L Y S I S   (7 DAY SAMPLE)

IDA AUTODIN COST ALLOCATION MODEL SUMMARY
(ANNUAL BASIS)

INPUT PARAMETERS

COSTS ($/YR)		TECHNICAL FACTORS		USAGE COST FACTORS	
SWITCH	43944160	AREA MEMORY		LINE BLOCKS	1.000
CONUS TRUNKS	355992	CAPACITY	21060	MESSAGES	0.000
OVRSEAS TRUNKS	1781988	AREA TRUNK		FLASH WEIGHTS	0.000
		TERMINATIONS	56		
TOTAL	46082140	INTER-AREA		SURCHARGES ($/UNIT)	
		TERMINATIONS	17		LOCAL AREA INTER
ADU MEMORY	8788832			ALL	.10 .15 .30
(ALPHA)	(.20)			FLASH	0.00 0.00 0.00

SAMPLE CHARACTERISTICS

DAYS OF TRAFFIC	NUMBER OF CONNECTIONS				VOLUME OF TRAFFIC		
	SLOW	MED	HIGH	TOTAL	LBLKS	MSGS	LBLK/MSG
7	893	315	114	1322	78319983	1963261	39

TYPE OF TRAFFIC				VOLUME OF FLASH TRAFFIC		
	LOCAL	AREA	INTER-AREA	LBLKS	MSGS	LBLK/MSG
LBLKS	20821427	16266368	41452188	115162	9251	12
MSGS	561475	492623	909863			

RATE ANALYSIS

COST ALLOCATION ($/YR)		ACCESS CHARGES ($/MO)		UTILIZATION RATES ($/UNIT)			
UTILIZATION	38146317	BASE CHANGE	43.01				INTER
CONNECTIVITY	7935823	SLOW SPEED	279.04		LOCAL	AREA	AREA
		MED SPEED	837.11	LBLKS	.0035	.0038	.0047
TOTAL	46082140	HIGH SPEED	1302.17	MESSAGES	.1000	.1500	.3000
				WEIGHTS	1.0000	1.0000	1.0000

BACKBONE CHARGES BY AGENCY

AGENCY	AGENCY CHARGES			PERCENT BREAKDOWN (WITHIN AGENCY)		CHARGES AS PERCENT OF TOTAL		
	UTILZATN	CONNEC	TOTAL	UTILZAIN	CONNEC	UTILZATN	CONNEC	TOTAL
D	1601263	562539	2163803	.74	.26	4.20	7.09	4.70
A	9952754	2417580	12370334	.80	.20	26.09	30.46	26.84
B	4584868	1338263	5923131	.77	.23	12.02	16.86	12.85
C	9089719	1632927	10722646	.85	.15	23.83	20.58	23.27
E	412359	92640	504999	.82	.18	1.08	1.17	1.10
F	42688	123693	166381	.26	.74	.11	1.56	.36
G	7116152	412975	7529128	.95	.05	18.65	5.20	16.34
M	5219	10045	15264	.34	.66	.01	.13	.03
N	1265	10045	11311	.11	.89	.00	.13	.02
P	326493	220998	547491	.60	.40	.86	2.78	1.19
W	11842	13394	25236	.47	.53	.03	.17	.05
X	524476	100453	624930	.84	.16	1.37	1.27	1.36
Z	4477417	1000070	5477487	.82	.18	11.74	12.60	11.89
TOTAL	38146317	7935823	46082140	.83	.17	100.00	100.00	100.00

A = utilization rate charged for message traffic

i = transmission unit, either line blocks or messages

x_i = volume of 'LOCAL' transmission units

y_i = volume of 'AREA' transmission units

z_i = volume of 'INTER-AREA' transmission units

F_i = volume of 'FLASH' transmission units.

In order to use this allocation formula several steps are followed. First, input parameters for the network are identified. These include total costs of the system, apportioned into percentages for switches and trunks, switch memory ratios (area and inter-area trunk terminations divided by line blocks passing through the switch), and arbitrary weights and surcharges for segmenting message traffic in a utilization pricing structure. Next, message traffic of the particular sample is examined in terms of geographical destination (local, area, or inter-area), and total traffic is broken down into separate line blocks and message counts. FLASH traffic, given top priority in transmission, is treated as a subcategory with the same breakdown so that both weights and surcharges can be assessed. In addition, the number of access lines is accumulated consistently with three groupings for transmission speeds (75-300 baud, 600-1200 baud, and 2400-4800 baud).

Third, PDC charges are set to be allocated using the connectivity/utilization ratio deemed optimal. Rates for connectivity typically have a standard connection charge for access to the network and a progressive rate scaled for the three transmission speed categories. Depending on the transmission unit used for message traffic—line blocks or messages—utilization rates are prorated according to precedence (FLASH or regular traffic) and geographical destination. Finally, total backbone charges are accumulated for each agency with subtotals for utilization and connectivity.

4.   The IDADIN Subprograms

The 16 IDADIN subprograms fall into three general categories: procedural, functional, and output.

a.   The Procedural Subprograms.   Subroutine CNNCT produces a breakdown of total ADU memory utilization by switch (Table C-9).   Subroutine ATA performs the agency traffic analysis, aggregating by the first letter of the program designator code, and produces the formatted printed output report shown in Appendix B.   Subroutine PRTATA is called by ATA to print the final summary table for the traffic analysis (Table C-10).   Subroutine CHARGE computes the cost allocation to any charging point (tributary) using the cost allocation model outlined earlier.   Arguments to the procedure supply information on the volume of traffic generated by the charging point and the parameters of the cost allocation model itself.   Subroutine OUTPUT produces the formatted printed output report of the results of the cost allocation model (Table C-13) and Subroutine TAB prints out the results by program designator code.

b.   The Functional Subprograms.   Subroutine PCT is called by Subroutine ATA to compute percentages of the agency total, system total in that class, and the overall system total (Table C-10).   Integer Function MATCH performs an integer linear search when called.   Integer Function SPDCLS returns as its function value the integer one, two, or three corresponding to the class of speed to which the argument belongs.   Real Function TOTAL returns as its function value the sum of the values of its real argument array and Integer Function SUM returns as its function value the sum of its integer argument array.   Subroutine CLEAR is used to zero an area of memory.

c.   The Output Routines.   Subroutine SAMPLE computes and places into common block PCA an alphanumeric representation of the numbers of days in the traffic sample.   Subroutine TITLE

prints the heading line on each page of printed output, sequentially numbering all pages starting with Page 1. It also prints the number of days in the sample using results supplied by Subroutine SAMPLE. Subroutine CENTER produces a line of printed output in which the argument to the subroutine is printed in the middle of the output page. Subroutine PAGE is used to control pagination and spacing in the output reports.

E. PROGRAM LISTING FOR DNCOSTCD

```
C                THE REVISED DNCOSTCD
      PROGRAM DNCOSTCD(INPUT,OUTPUT,TAPE1,TAPE2,TAPE3,TAPE5=INPUT)
C     TAPE1=AMIF, TAPE2=SARTYRF, TAPE3=STASUB (OUTPUT)
      INTEGER SWITCH(17),GAC(17),I,J,K,KSWTCH,AMIE(6),W(7),
     1T(18),L(4,3),BLANK,Z,TRIB(2),ZZZ,LINE,READ,NNN,L1,L2,L3,L4
      LOGICAL EIF
      COMMON/GEOG/KSWTCH,SWITCH,GAC
      DATA BLANK/0H       /,L/6,9,13 16,7,10,14 17,8,11,15,18/,Z/1HZ/,
     1THIM/0.0/,ZZZ/3HZZZ/,EIF/.FALSE./,LINE/60/
      I=0
10    READ(5,1000)J,K
      IF(EOF(5))40,20
20    I=I+1
      IF(I.LE.17)GO TO 30
      PRINT 1010
      STOP
30    SWITCH(I)=J
      GAC(I)=K
      GO TO 10
40    KSWTCH=I
      CALL SCRT(KSWTCH,SWITCH,GAC)
      PRINT 1070,(SWITCH(I),GAC(I),I=1,KSWTCH)
      RESOT(1,1050)AMIE
      READ=1
      CALL TACK(1)
      PRINT 1080
      GO TO (50,03,125,140),READ
50    READ=1
      READ(2,1030)W
60    K=1
      IF(W(3).EQ.W(5))GO TO 70
      K=2
      IF(LOC(W(3)).NE.LOC(W(5)))K=3
70    T(1)=W(3)
      T(2)=W(4)
      T(3)=W(7)
      T(4)=BLANK
      T(5)=BLANK
      DO 80 I=6,18
80    T(I)=0
      L1=L(1,K)
      L2=L(2,K)
      L3=L(3,K)
      L4=L(4,K)
      T(L1)=W(6)
      T(12)=1
      T(L3)=1
      IF(W(2).NE.4)GO TO 90
      T(L2)=W(6)
      T(L4)=1
90    IF(AMIE(2).EQ.BLANK)GO TO 125
      IF(T(1).LE.AMIE(1))GO TO 110
95    READ=2
      READ(1,1020)AMIE
      IF(EOF(1))40,90
100   AMIE(1)=ZZZ
      AMIE(2)=NNN
```

```
      GO TO 140
110   IF(T(1).LT.AMIE(1))GO TO 140
120   IF(T(2).LE.AMIE(2))GO TO 130
125   READ=3
      READ(1,102n)AMIE
      IF(EOF(1))140,90
130   IF(T(2).LT.AMIE(2))GO TO 140
      T(4)=AMIE(3)
      T(5)=AMIE(4)
140   R=AU=4
      READ(2,103n)W
      IF(EOF(2))170,150
150   IF(W(3).NE.T(1).OR.W(4).NE.T(2))GO TO 180
      K=1
      IF(W(3).EQ.W(5))GO TO 160
      K=2
      IF(LOC(W(3)).EQ.LOC(W(5)))K=3
160   L1=L(1,K)
      L2=L(2,K)
      L3=L(3,K)
      L4=L(4,K)
      T(L1)=T(L1)+W(6)
      T(L3)=T(L3)+1
      T(12)=T(12)+1
      IF(W(3).NE.6)GO TO 140
      T(L2)=T(L2)+W(6)
      T(L4)=T(L4)+1
      G. TO 140
170   EOF=.TRUE.
180   LINE=LINE+1
      IF(LINE.LE.60)GO TO 190
      LINE=1
      PRINT 104n
190   PRINT 105n,T
      WRITE(3,104n)T
      IF(.NOT.EOF)GO TO 60
      STOP
100n  FORMAT(A3,A1)
101n  FORMAT(*1TOO MANY SWITCH CODES.*)
102n  FORMAT(2A3,CA4)
103n  FORMAT(A3,A1,3A3,I3,A6)
104n  FORMAT(1H1)
105n  FORMAT(1X,2A3,2X,A6,2X,A4,2X,A4,1318)
106n  FORMAT(A3,A3,A6,2A4,3I9,3I6,7X,I8,6I9)
107n  FORMAT(*1SWITCH DESIGNATIONS ARE */(/5X,A3,5X,A1))
108n  FORMAT(*-RETURN FROM INPUT ERROR.*)
      END
```

```
      SUBROUTINE SORT(K,N,T)
      INTEGER I,J,P,Q,H,N(1),T(1)
      Q=K-1
      DU 20 I=1,Q
      P=I+1
      IF(P.GT.K)GU TO 20
      DU 10 J=P,K
      IF(N(J).GE.N(I))GO TO 10
      H=N(I)
      N(I)=N(J)
      N(J)=H
      H=T(I)
      T(I)=T(J)
      T(J)=H
   10 CONTINUE
   20 CONTINUE
      RETURN
      END
```

```
      INTEGER FUNCTION LOC(T)
      INTEGER I,J,K,T,N,S,CODE,P
      COMMON/GEOG/N,S(17),CODE(17)
      J=(N+1)/2
      I=1
      K=N
      DO 30 P=1,N
      IF(T.EQ.S(J))GO TO 50
      IF(T.LT.S(J))GO TO 10
      I=J+1
      GU TO 20
   10 K=J-1
   20 IF(K.LE.0.OR.K.GT.N)GO TO 40
      J=(I+1)/2+I
   30 CONTINUE
   40 PRINT 1000,T
      LOC=0
      RETURN
   50 LOC=CODE(J)
      RETURN
 1000 FORMAT(8H2SWITCH NOT FOUND---0,A3)
      END
```

F. PROGRAM LISTING FOR IDADIN

```
      PROGRAM IDADIN(INPUT,OUTPUT,TAPE1,TAPE5=INPUT)

C--------------------------------------------------------------
C     THIS PROGRAM IS THE IDA FORTRAN VERSION OF THE DEFENSE
C     COMMUNICATIONS AGENCY PL1 COMPUTER PROGRAM DNCOSTHP
C     (THE DUTCDIN COST ALLOCATION MODEL).  PL1/FORTRAN
C     CONVERSION AND PROGRAMMING MODIFICATIONS BY RADUCHEL,
C     FRY, KIERNAN, AND DAVIDSON, MARCH 1977.
C--------------------------------------------------------------

      COMMON/IP/RIP1,RIP2,RIP3,RIP4,RIP5,RIP6,RIP7,RIP8,RIP9,RIP10,
     X    RIP11,RIP12,RIP13
      COMMON/SC/LBLOCAL,LBAREA,LBIA,LBVOL,LBMS,
     X   MSLOCAL,MSAREA,MSIA,MSVOL,
     X   FLOVOL,FMSVOL,FLBMS,
     S   NCNSLOW,NCNMED,NCNHI,ICONS
      COMMON/RA/RA1,RA2,RA3,RA4,RA5,RA6,RA7,RA8,RA9,RA10,RA11,RA12,RA13

      DIMENSION LBPDC(150),MSPDC(150),NCNPDC(150)

      INTEGER W(10),TOTAL(15),PDC(15,150),CODES(150),KCODES,I,J,K,L(12),
     SL1,L2,TU(5),SPDBLK(3),LOC,LINE,AGENCY,SPDCLS,TOT(15),CONN(3,9),
     SSWITCH(9),FLHVOL,FMSVOL,FLBMS,SUM,IOPT

      REAL S,COST,MCOST,TRIC,TROC,TRKC,TRKT,LBLKS,USE(3,2),CON(3),AFHG(3
     S),X(6),T(3),FLASH,X1,X2,PDCCST(3,150),PCNT(3),CHG(3,3),BLOCKS,
     SMSGCHG(6),MSGWTS(3),SHARE(2),X3
      REAL PCNTOP(3),ALHGOP(3)

      LOGICAL BRKDWN,PRTIA
      DATA BRKDWN/.FALSE./,BLOCKS/0.0/,FLASH/0.0/,SPDBLK/3,9,14/,MSGCHG/
     S6*0.0/,MLBALC/0.0/,MSGWTS/3*1.0/,PRTTA/.TRUE./
      DATA L/6,7,8,9,10,11,13,14,15,16,17,18/
      DATA SWITCH/3HUEF,3HUED,3HUEO,3HUCI,3HUCL,3HUWJ,3HUWM,3HUWT,3HUHH/
      COMMON/PCA/IOPT,DAYS
      NAMELIST/LIST/SWCOST,MCOST,TRIC,TROC,TRKC,TRKT,LBLKS,BRKDWN,
     SSPDBLK,FLASH,BLOCKS,MSGCHG,MSGWTS,PRTIA
      IOPT=7
C     INPUT COST BASIS

C READ OPTION CARD
      READ(5,LIST)
      CALL SAMPLE
C     NOW, PRINT THEM OUT FORMATTED
      CALL CLEAR(225,PDC)
      CALL CLEAR(27,CONN)

C     READ IN FIRST DATA RECORD + SETUP LOOP
      READ(1,1010)W
      KCODES=1
      CODES(1)=W(4)
      K=1
      L1=1
      DO 20 I=1,3
      J=12+I
      TOTAL(J)=0
      PDC(J,1)=0
```

```
      DO 20 J=1,4
      L1=2-1+1
      L2=L(L1)
      TOTAL(L1)=W(L2)
   20 PDC(L1+1)=X(L2)
      I=SPDCLS(W(3))+12
      TOTAL(I)=1
      PDC(I,1)=1
      IU(1)=X(1)
      IU(2)=X(2)
      I=I-12
      J=MATCH(W(1),4,SWITCH)
      IF(J.GT.0)CONV(I,J)=1
C     BEGIN BASIC LOOP
   30 READ(1,510)W
      IF(EOF(1))H=84
   40 DO 50 K=1,KCODES
      IF(W(4).EQ.CODES(K))GO TO 60
   50 CONTINUE
      KCODES=MIN0(15,KCODES+1)
      CODES(KCODES)=W(4)
      K=KCODES
   60 DO 70 L1=1,12
      L2=L(L1)
      TOTAL(L1)=TOTAL(L1)+W(L2)
   70 PDC(L1,K)=PDC(L1,K)+W(L2)
      IF(W(1).EQ.ID(1).AND.W(2).EQ.ID(2))GO TO 30
      IU(1)=X(1)
      IU(2)=X(2)
      I=SPDCLS(W(5))+12
      TOTAL(I)=TOTAL(I)+1
      PDC(I,K)=PDC(I,K)+1
      J = MATCH(W(1),4,SWITCH)
      I=I-12
      IF(J.GT.0)CONV(I,J) = CONV(I,J)+1
      GO TO 30
C     END OF BASIC LOOP/COMPUTE COST FACTORS
   80 IF(.NOT.PRT14)GO TO 85
      CALL CONCI(4,SWITCH,CONN)
      CALL ATA(KCODES,CODES,PDC)
C     BEGIN BASIC RECMAKING LOOP
C
   85 CALL CLEAR(3,ACMGUP)
      CALL CLEAR(3,PGNTUP)
      RIP1 = SWCOST*52.
      RIP2 = MCOST*52.
      RIP3 = TRIC*52.
      RIP4 = TRUC*52.
      RIP5 = RIP1 + RIP3 + RIP4
      RIP6 = CHLKS
      RIP7 = IRKC
      RIP8 = IRRI
      L1=
      L2=3
      L1=
      L2=3
      K=
      DO 100 I=1,2
```

```
          DU ,. J=1,3
          K=K+1
          L1=L1+1
          L2=L2+1
   90     X(K)=FLOAT(TOTAL(L1))+FLASH*FLOAT(TOTAL(L2))
          L1=L1+3
  100     L2=L2+3
          L1=3
          L2=3
          T(1)=0
          T(2)=0
          DO 110 I=1,3
          L1=L1+1
          L2=L2+1
          T(1)= T(1)+MSGCHG(L1-6)*FLOAT(TOTAL(L1))
  110     T(2)= T(2)+MSGCHG(L2-6)*FLOAT(TOTAL(L2))
          T(3)=S.COST-MCOST-T(1)-T(2)
C         COMPUTE MEMORY RATIOS
          X1=28.0*THKC/LHLRS
          X2=28.0*THKI/LHLRS
C         COMPUTE UTILIZATION PRICES
          J=1
          DO 120 I=1,2
          X3=T(3)/(MSGWTS(1)*X(J)+MSGWTS(2)*X(J+1)+MSGWTS(3)*X(J+2))
          USE(1,I)=MSGWTS(1)*X3
          USE(2,I)=(TRKIC+A1*MCOST)/(X(J+1)+X(J+2))
          USE(3,I)=USE(2,I)+(TRKC+X2*MCOST)/X(J+2)+MSGWTS(3)*X3
          USE(2,I)=USE(2,I)+X3*MSGWTS(2)
  120     J=J+3
          SHARE(1)=AMAX1(0.0,AMIN1(1.0,BLOCKS))
          SHARE(2)=1.0-SHARE(1)
          RIP9 = SHARE(1)
          RIP10 = SHARE(2)
          DO 130 I=1,2
          DO 130 J=1,3
  130     USE(J,I)=USE(J,I)*SHARE(1)
C         COMPUTE STANDARD CONNECT RATE THEN BY SPEED
          A1=(1.-X1-X2)*MCOST
          K=TOTAL(13)*SPDBLK(1)+TOTAL(14)*SPDBLK(2)+TOTAL(15)*SPDBLK(3)
          X2=1/FLOAT(K)
          DO 140 I=1,3
          CON(I)=X2*FLOAT(SPDBLK(I))
  140     T(I)=4.33333*CON(I)
          X2=4.333333*X2
C         PRINT OUT COSTS AT PDC
          RIP11 = FLASH
          RIP12 = MSGCHG(1)
          RIP13 = MSGCHG(1)
          RA4 = X2
          RA5 = T(1)
          RA6 = T(2)
          RA7 = T(3)
          RA8 = USE(1,1)
          RA9 = USE(2,1)
          RA10 = USE(3,1)
          RA11 = USE(1,2)+MSGCHG(1)
          RA12=MSGCHG(2)+USE(2,2)
          RA13=USE(3,2)+MSGCHG(3)
```

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```
      CALL CHARGE(TOTAL,USE,CON,FLASH,MSGCHG,T)
      KA1 = T(1)*52.
      KA2 = T(2)*52.
      KA3 = T(3)*52.
      LINE=0
C LINE BLOCKS
      LBLOCAL = SUM(RCODES,PDC(1,1),15)
      LBAREA = SUM(RCODES,PDC(2,1),15)
      LBI  = SUM(RCODES,PDC(3,1),15)
      LBVOL = LBLOCAL + LBAREA + LBIA
C MESSAGES
      MSLOCAL = SUM(RCODES,PDC(7,1),15)
      MSAREA = SUM(RCODES,PDC(8,1),15)
      MSI  = SUM(RCODES,PDC(9,1),15)
      MSVOL = MSLOCAL + MSAREA + MSIA
      LBMS = LBVOL/MSVOL
C CONNECTIONS
      NCNSLO = SUM(RCODES,PDC(13,1),15)
      NCNMED = SUM(RCODES,PDC(14,1),15)
      NCNHI  = SUM(RCODES,PDC(15,1),15)
      ICONS = NCNSLO + NCNMED + NCNHI
C FLASH LINE BLOCKS
      FLBVOL = 0
      DO 500 J=4,6
  500 FLBVOL = FLBVOL + SUM(RCODES,PDC(J,1),15)
C FLASH MESSAGES
      FMSVOL = 0
      DO 501 J=10,12
  501 FMSVOL = FMSVOL+SUM(RCODES,PDC(J,1),15)
      FLHS = FLBVOL/FMSVOL
      DO 150 I=1,RCODES
  150 CALL CHARGE(PDC(I,1),USE,CON,FLASH,MSGCHG,PDCCST(1,1))
      CALL TAB(RCODES,CODES,PDCCST)
      CALL OUTPUT(MSGCHG,MSGWDS)
C     PRINT OUT COSTS BY AGENCY
      DECODE(1,1990,CODES(1))AGENCY
      DO 160 I=1,3
  160 ACHG(I)=PDCCST(I,1)
      K=1
  170 K=K+1
      DECODE(1,1990,CODES(K))J
      IF(AGENCY.NE.J)GO TO 190
      DO 180 I=1,3
  180 ACHG(I) = ACHG(I)+PDCCST(I,K)
      IF(K.LT.RCODES)GO TO 170
  190 DO 200 I=1,3
      PCNT(I) = (100.0*ACHG(I)/T(I))
      PCNTOF(I) = PCNTOF(I)+PCNT(I)
      ACHGT = ACHG(1)*52.
      ACHGOF(I) = ACHGOF(I) + ACHG(I)
  200 CONTINUE
      X1=ACHG(1)/ACHG(3)
      X2=ACHG(2)/ACHG(3)
      IF(AGENCY.EQ.IF)AGENCY = IMD
      PRINT 1200,AGENCY,ACHG,X1,X2,PCNT
      DO 210 I=1,3
  210 ACHG(I)=PDCCST(I,K)
      AGENCY=J
```

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```
      IF(N.LT.KCODES)GO TO 170
      DO 220 I=1,3
      PCNT(I) = (100.0*ACHG(I)/T(I))
      PCNTUP(I) = PCNTUP(I)+PCNT(I)
      ACHG(I) = ACHG(I)*52.
      ACHGUP(I) = ACHGUP(I) + ACHG(I)
  220 CONTINUE
      X1=ACHG(1)/ACHG(3)
      X2=ACHG(2)/ACHG(3)
      PRINT 1000,AGENCY,ACHG,X1,X2,PCNT
      X1TOT = ACHGUP(1)/ACHGUP(3)
      X2TOT = ACHGUP(2)/ACHGUP(3)
      PRINT 1005,ACHGUP,X1TOT,X2TOT,PCNTOP
C     CHECK IF BREAKDOWN REQUESTED
      IF(.NOT.BRKDWN)GO TO 350
C     PRINT OUT BREAKDOWN
      DO 230 I=1,3
      TOT(I+12)=0
      DO 230 J=1,3
  230 CHG(J,I)=0
      LINE=0
      REWIND 1
      READ(1,1010)W
  240 DO 250 I=1,5
  250 ID(I)=W(I)
      DO 260 L1=1,12
      L2=L(L1)
  260 TOT(L1)=W(L2)
C     BEGIN LOOP FOR TRIBUTARY
  270 READ(1,1010)W
      IF(EOF(1))340,280
  280 IF(W(1).NE.ID(1).OR.W(2).NE.ID(2))GO TO 300
      DO 290 L1=1,12
      L2=L(L1)
  290 TOT(L1)=TOT(L1)+W(L2)
      GO TO 270
  300 K=12+SPECLS(ID(5))
      TOT(K)=1
      CALL CHARGE(TOT,USE,CON,FLASH,MSGCHG,CHG)
      TOT(K)=0
      CALL PAGE(LINE,1)
      PRINT 1110,ID(1),ID(2),(CHG(I,1),I=1,3)
      DO 310 I=1,3
  310 CHG(I,2)=CHG(I,2)+CHG(I,1)
      IF(W(1).EQ.ID(1))GO TO 240
      CALL PAGE(LINE,2)
      PRINT 1120,ID(1),(CHG(I,2),I=1,3)
      DO 320 I=1,3
      CHG(I,3)=CHG(I,3)+CHG(I,2)
  320 CHG(I,2)=0
      IF(W(4).EQ.ID(4))GO TO 240
      CALL PAGE(LINE,3)
      PRINT 1130,ID(4),(CHG(I,3),I=1,3)
      DO 330 I=1,3
  330 CHG(I,3)=0
      GO TO 240
  340 CALL PAGE(LINE,2)
      PRINT 1120,ID(1),(CHG(I,2),I=1,3)
```

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```
      CALL PAGE(LINE,3)
      PRINT 1130,(ID(5),(CHG(I,J),I=1,3)
 350  READ(5,LIST)
      IF (EOF(5)) STOP
      GO TO 5
1000  FORMAT(3X,A1,3X,3(1X,F9.0),2X,2(5X,F3.2),4X,2(4X,F5.2),2X,F5.2)
  003 FORMAT(8I10)
1005  FORMAT(/2X,*TOTAL*,3F10.0,2X,2(5X,F3.2),6X,F7.2,F9.2,F7.2)
1010  FORMAT(2A3,A6,A4,I4,3I9,3I6,7X,I8,6I0)
  090 FORMAT(A )
1100  FORMAT(*0*,3X,A1,7X,3F15.2,10X,3F15.2,10X,2F5.2)
1110  FORMAT(3X,2A3,11X,3F15.2)
1120  FORMAT(*0$ASC...*,A3,9X,3F15.2//)
1130  FORMAT(* $PUC...*,A4,8X,3F15.2//)
      END
```

```
      SUBROUTINE SAMPLE
      INTEGER A,BLANK,I,K,LP,S,T(4)
      DATA BLANK/1H /,LP/1H(/
      COMMON/PCA/R,A
      ENCODE(4,1000,S)R
      DECODE(4,1010,S)T
      DO 10 I=2,4
   10 IF(T(I).NE.BLANK) GO TO 20
   20 T(I-1) = LP
      ENCODE(4,1010,A)T
      RETURN
 1000 FORMAT(I4)
 1010 FORMAT(4A1)
      END
```

C-37

```
      SUBROUTINE CNNC(K,S,N)
      INTEGER K,S(1),N(3,1),TOTAL,USE(3),J,L
      DATA USE/6,16,20/,TOTAL/4170/
      PRINT 1000
      DO 20 I=1,K
      L = 0
      DO 10 J=1,3
   10 L = L+USE(J)*N(J,1)
      L = (100*L+TOTAL-1)/TOTAL
   20 PRINT 1010,S(1),(N(J,1),J=1,3),L
      RETURN
 1000 FORMAT(*1*,10X,*EDU MEMORY UTILIZATION BY SWITCH*/* SWITCH*,11X,
     $*SLOW*,9X,*MEDIUM*,11X,*HIGH*,8X,*PERCENT*///)
 1010 FORMAT(1H ,3X,I3,2I15)
      END
```

C-38

```
      SUBROUTINE ATA(N,C,P)
      INTEGER I,J,K,L,M,N,KDAYS,LINE,SUM,AGENCY(25),C(1),D(25),
     $H1(4,3),H2(4,4),LIT(3),P(3,5,1),T(3,5,25)
      REAL X(4,5,25),R,S,U(8,25,4),W
      COMMON/PCA/KDAYS
      DATA LIT/1HD,1H*,1H,/
      DATA H1/10H*L I N E ,10H B L O C K,3H S*,1H ,10HLINE BLOCK,
     $10HS PER MESS,3HAGE 1H ,10H*M E S S A,7H G E S* 1H  1H /
      DATA H2/6HTOTALS,3*1H ,10HAS PERCENT,10H OF AGENCY,10H TRAFFIC H,
     $10HY CLASS   ,10HAS PERCENT,10H OF SYSTEM,10H TRAFFIC H,
     $10HY CLASS   ,10HAS PERCENT,10M OF TOTAL ,10HSYSTEM TRA,4HFFIC/
      EQUIVALENCE (AGENCY(1),U(1))
      L=1
      M=0
      CALL CLEAR(375,T)
      LINE=LIT(2)
   10 DECODE(1,1000,C(L))K
      IF(K.EQ.LINE)GO TO 20
      M=M+1
      AGENCY(M)=K
      LINE=K
   20 DO 30 J=1,5
      DO 30 I=1,3
   30 T(I,J,M)=T(I,J,M)+P(I,J,L)
      L=L+1
      IF(L.LE.N)GO TO 10
      DO 50 K=1,M
      DO 50 J=1,5
      S=0
      DO 40 I=1,3
      R=FLOAT(T(I,J,K))
      S=S+R
   40 X(I,J,K)=R
   50 X(4,J,K)=S
      L=M+1
      DO 60 J=1,5
      DO 60 I=1,4
   60 A(I,J,L)=TOTAL(M,A(I,J,1),201)
      CALL PCT(L,A(1,5,1),20,U,8,25)
      AGENCY(1)=LIT(2)
      AGENCY(L)=LIT(3)
      CALL TITLE
      PRINT 1020
      DO 70 K=1,L
   70 PRINT 1030,AGENCY(K),(X(1,5,K),(U(I,K,J),J=1,3),I=1,4)
      DO 80 K=1,3,2
      DO 80 J=1,L
      DO 80 I=1,4
      U(I,J,1)=X(I,K,J)
   80 U(I+4,J,1)=A(I,K,1,J)
      CALL PCT(L,U,8,U(1,1,2),8,25)
      CALL PCT(L,U(5,1,1),8,U(5,1,2),8,25)
      DO 90 J=1,4
      CALL TITLE
      CALL CENTER(40,H1(1,K))
      CALL CENTER(40,H1(1,J))
   90 CALL PRTATA(L,AGENCY,U(1,1,J))
```

C-39

```
      CALL TITLE
      CALL CENTER(4.,M1(1,2))
      DO 100 J=1,L
      DO 100 I=1,4
      S=X(1,3,J)
      R=0.0
      IF(S.GT.0.0)R=X(1,1,J)/S
      U(I,J,1)=R
      S=X(1,4,J)
      R=0.0
      IF(S.GT.0.0)R=X(1,2,J)/S
 100  U(I+4,J,1)=R
      CALL PRTATA(L,AGENCY,U)
      LINE=4
      DO 150 M=1,L
      K=0
      DO 120 J=1,4
      L=0
      DO 110 I=1,3
      K=K+1
      D(K)=D(I,J,K)
 110  L=L+D(K)
      K=K+1
 120  D(K)=L
      DO 130 I=1,K
      L=D(I,J)
      J=0
      IF(L.GT.0)J=(D(I)*L/2)/L
      K=K+1
 130  D(K)=J
      L=0
      DO 140 I=1,3
      K=K+1
      D(K)=F(I,5,K)
 140  L=L+D(K)
      D(24)=L
      LINE=LINE+4
      IF(LINE.LE.40)GO TO 150
      LINE=4
      CALL TITLE
      PRINT 1040
 150  PRINT 1050,C(M),L
      RETURN
1000  FORMAT(A1)
1020  FORMAT(*-*,45X,*S Y S T E M   A C C E S S   A N A L Y S I S*///
     $*0AGENCY*/1H0.1,X.*S L O W*,24X,*M E D I U M*,23X,*H I G H*,2AX,
     $*A L L*/5X,4(*  NUMBER   AGENCY  SYSTEM    TOTAL*) /5X,4(8X,* PERCEN
     $T PERCENT PERCENT*)//)
1030  FORMAT(1H0,1X,A1,CX,4(F8.0,3F8.2))
1040  FORMAT(1H-,20X,34H*R E G U L A R   T R A F F I C*,17X,26H*F L A S H
     $  T R A F F I C*/6H PROGRAM,3X,2(19X,12HLINE  BLOCKS,14X),11X,
     $13H*CONNECTIONS*/11H DESIGNATOR,2(21X,6HMESSAGES,1,X)/5H CODE,
     $6X,2(13X,23HLINE BLOCKS PER MESSAGE,9X)/8X,25HLOW  MEDIUM   HIGH
     $   ALL/11X,2(10X,5HLOCAL,6X,4HAREA,5X,5HINTER,7X,3HALL))
1050  FORMAT(1H0,A4,6A,2(5X,4I10),2(/11X,5X,4I10,5X,4I10),4X,4I7)
      END
```

```
      SUBROUTINE PRTaIR(N,C,X)
      INTEGER I,J,K,N,C(1)
      REAL X(4,2,1)
      PRINT 1000
      DO 10 I=1,N
   10 PRINT 1010,C(I),((X(J,K,I),J=1,4),K=1,2)
      RETURN
 1000 FORMAT(* AGENCY*,17X,30H*R E G U L A R   T R A F F I C*,36X,26H*F I
     S A S H   T R A F F I C*/5X,2(14X,*LOCAL*,11X,*AREA*,5X,
     S*INTER-AREA*,12X,*ALL*)//)
 1010 FORMAT(1H0,3X,A1,C(4X,4F15.2))
      END
```

```
      SUBROUTINE PCT(N,A,MR,P,MR1,MR2)
      INTEGER I,J,N,NR,MR,MR1,MR2
      REAL X(MR,1),P(MR,1,MR2,1),R,S,T,W
      R=0.0
      IF(X(4,N).NE.0.0)R=100.0/X(4,N)
      DO 10 J=1,N
      S=0.0
      IF(X(4,J).NE.0.0)S=100.0/X(4,J)
      DO 10 I=1,4
      W=X(I,J)
      P(I,J,1)=S*W
      T=0
      IF(X(I,N).NE.0.0)T=W*100.0/X(I,N)
      P(I,J,2)=T
   10 P(I,J,3)=R*W
      RETURN
      END
```

```
      SUBROUTINE CHANGE (N,USE,CON,F,G,C)
      REAL      X(15),USE(3,2),CON(3),F,G(6),C(3)
      INTEGER I,N(15)
      DO 10 I=1,15
   10 X(I)=N(I)
      C(1)=0
      C(2)=0
      DO 20 I=1,3
      C(1)=C(1)+G(I)*X(I+6)+G(I+3)*X(9+I)+USE(I,1)*(X(I)+F*X(I+3))+
     *USE(I,2)*(X(I+6)+F*X(I+9))
   20 C(2)=C(2)+CON(I)*X(I+12)
      C(3)=C(1)+C(2)
      RETURN
      END
```

```
      SUBROUTINE TAB(K,P,C)
      INTEGER I,J,K,L,M,N,N1,N2,N3
      REAL P(1),C(3,1)
      COMMON/PCA/IOPT
      INTEGER M(5)
      DATA M/10HAUTOMATI-I ,10HCOSTS BY P,10HROGRAM DES,10HIGNATOR CO,
     S2HDE/
      CALL TITLE
      CALL CENTER(50,M)
      PRINT 1000
      K=N/3
      N1=1
      N2=(N+2)/3+1
      N3=N2+K
      IF(MOD(N,3).EQ.2)N3=N3+1
      DO 10 I=1,K
      PRINT 1010,P(I),(C(I,N1),I=1,3),P(N2),(C(I,N2),I=1,3),P(N3),
     S(C(I,N3),I=1,3)
      N1=N1+1
      N2=N2+1
   10 N3=N3+1
      IF(N3.EQ.N+1)RETURN
      K=K+
      PRINT 1010,(P(I),(C(J,I),J=1,3),I=N1,K,N2)
      RETURN
 1000 FORMAT(1H0,3(*PDC  UTILIZATION CONNECTIVITY      TOTAL  *)//)
 1010 FORMAT(1X,3(A4,F12.0,F13.0,F12.0,3X))
      END
```

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```
      SUBROUTINE OUTPUT(MSGCHG,MSGWTS)
      REAL MSGCHG(6),MSGWTS(3)
      INTEGER I,FLHVOL,FMSVOL,FLBMS
      COMMON/IP/RIP1,RIP2,RIP3,RIP4,RIP5,RIP6,RIP7,RIP8,RIP9,RIP10,
     X   RIP11,RIP12,RIP13
      COMMON/SC/LHLOCAL,LHAREA,LBIA,LHVOL,LBMS,
     X   MSLOCAL,MSAREA,MSIA,MSVOL,
     X   FLBVOL,FMSVOL,FLBMS,
     S   NCNSLOW,NCNMED,NCNHI,ICONS
      COMMON/PCA/IOPT
      COMMON/RA/RA1,RA2,RA3,RA4,RA5,RA6,RA7,RA8,RA9,RA10,RA11,RA12,RA13
C THIS IS THE INPUT SECTION
      CALL TITLE
      PRINT 3
      PRINT 1
      PRINT 4
      PRINT 5
      PRINT 6,RIP1, RIP9
      PRINT 7,RIP3, RIP6, RIP10
      PRINT 8,RIP4, RIP11
      PRINT 9,       RIP7
      PRINT 10,RIP5
      PRINT 11,      RIP8
      PRINT 12,(MSGCHG(I),I=1,3)
      PRINT 13,RIP2,(MSGCHG(I), I=4,6)
C THIS IS THE SAMPLE CHARACTERISTICS SECTION
      PRINT 15
      PRINT 16
      PRINT 17,IOPT
      PRINT 18,NCNSLOW,NCNMED,NCNHI,ICONS, LHVOL,MSVOL,LBMS
      PRINT 19
      PRINT 21
      PRINT 22,LHLOCAL,LBAREA,LBIA,  FLBVOL,FMSVOL,FLBMS
      PRINT 23,MSLOCAL,MSAREA,MSIA
C THIS IS THE RATE ANALYSIS SECTION
      PRINT 31
      PRINT 32
      PRINT 33,RA1, RA4
      PRINT 34,RA2, RA5
      PRINT 35,RA6 ,RA8, RA9, RA10
      PRINT 36,RA3, RA7, RA11,RA12,RA13
      PRINT 37,MSGWTS
      PRINT 41
      PRINT 42
      PRINT 43
      PRINT 44
    1 FORMAT(/)
    2 FORMAT(//)
    3 FORMAT(1H-,23X,*ICA AUTODIN COST ALLOCATION MODEL SUMMARY*,/,
     X   36X,*(ANNUAL BASIS)*)
    8 FORMAT(35X,*INPUT PARAMETERS*,/)
    5 FORMAT(9X,*COSTS ($/YR)*,14X,*TECHNICAL FACTORS*,10X,*USAGE COST F
     XACTORS*,/)
    6 FORMAT(11X,*SWITCH*,2X,F8.0,6X,*AREA MEMORY*,21X,*LINE BLOCKS*,
     X   3X,F6.3)
    7 FORMAT(5X,*CONUS TRUNKS*,2X,F8.0,
     X                              12X,*CAPACITY*, 2X,F5.0,14X,
```

```
      X      *MESSAGES*,3X,F6.3)
    8 FORMAT(3X,*OVERSEAS TRUNKS*,
      X                            2X,F8.0,6X,*AREA TRUNK*,20X,*FLASH*,1X,
      X    *EIGHTS*,3X,F6.3)
    9 FORMAT(35X,*TERMINATIONS*,2X,F5.0)
   10 FORMAT(11X,*TOTAL *,2X,F9.0,6X,
      X            *INTER-AREA*,19X,*SURCHARGES ($/UNIT)*)
   11 FORMAT(35X,*TERMINATIONS*,F7.0,13X,* LOCAL  AREA INTER*)
   12 FORMAT(92X,*ALL *,3F6.2)
   13 FORMAT(7X,*ADD MEMORY*,F10.0,33X,*FLASH*,2X,3F6.2,//)
   15 FORMAT(32X,*SAMPLE CHARACTERISTICS*,/)
   16 FORMAT(9X,*DAYS OF TRAFFIC*,8X,*NUMBER OF CONNECTIONS*,
      X       1?X,*VOLUME OF TRAFFIC*)
   17 FORMAT(14X,I5,13X,*SLOW*,3X,*MED*,3X,*HIGH*,3X,*TOTAL*,5X,
      X    *LBLKS*,2X,*MSGS*,2X,*LBLK/MSG*)
   18 FORMAT(30X,I4,2X,I4,2X,I,3X,I5,3X,I9,2X,I8,3X,I4,/)
   19 FORMAT(15X,*TYPE OF TRAFFIC*,29X,*VOLUME OF FLASH TRAFFIC*)
   21 FORMAT(10X,*LOCAL*,9X,*AREA*,5X,*INTER-AREA*,17X,*LBLKS*,4X,*MSGS*
      X  ,4X,*LBLK/MSG*)
   22 FORMAT(1X,*LBLKS*,2X,I9,4X,I9,4X,I9,16X,I7,2X,I6,5X,I4)
   23 FORMAT(2X,*MSGS*,2X,I9,4X,I9,4X,I9,//)
   31 FORMAT(35X,*RATE ANALYSIS*,/)
   32 FORMAT(1X,*COST ALLOCATION*($/YR)*,4X,*ACCESS CHARGES*,1X,
      X    *($/MO)*,8X,*UTILIZATION RATES*,1X,*($/UNIT)*)
   33 FORMAT(2X,*UTILIZATION*,2X,F9.0,3X,*BASE CHARGE*,2X,F7.2,33X,
      X  *I4*)
   34 FORMAT(1X,*CONNECTIVITY*,2X,F9.0,4X,*SLOW SPEED*,2X,F7.2,14X,
      X   *LOCAL*,5X,*AREA*,5X,*AREA*)
   35 FORMAT(29X,*MED SPEED*,2X,F7.2,6X,*LBLKS*,3(2X,F7.4))
      X   *LOCAL*,5X,*AREA*,5X,*AREA*)
   36 FORMAT(8X,*TOTAL*,F11.0,4X,*HIGH SPEED*,F9.2,*   MESSAGES*,3F9.4)
   37 FORMAT(51X,*WEIGHTS*,3F9.4,/)
   41 FORMAT(1H0,29X,*BACKBONE CHARGES BY AGENCY*)
   42 FORMAT(4,1X,*PERCENT BREAKDOWN*,10X,*CHARGES AS*)
   43 FORMAT(10X,*AGENCY CHARGES*,18X,* (WITHIN AGENCY)*,4X,
      X    *PERCENT OF TOTAL*)
   44 FORMAT(1X,*AGENCY*,2X,*UTILZATN*,4X,*CONNEC*,4X,*TOTAL*,
      X  5X,*UTILZATN*,2X,*CONNEC*,2X,*UTILZATN*,2X,*CONNEC*,2X,*TOTAL*)
      RETURN
      END
```

```
      SUBROUTINE TITLE
      INTEGER PAGE,KDAYS
      COMMON/PCA/KDAYS,SAMPLE
      DATA PAGE/0/
      PAGE=PAGE+1
      PRINT 1000,SAMPLE,PAGE
      RETURN
1000  FORMAT(*1A U T O D I N - I  T R A F F I C  A N A L Y S I S      *,
     SA4,* DAY SAMPLE)*,50X,*PAGE*,I4//)
      END
```

```
      SUBROUTINE CENTER(N,T)
      INTEGER I,J,K,N,T(1),BLANK,A(132)
      DATA BLANK/1H /
      DECODE(N,1000,T)(A(I),I=1,N)
      K=N
   10 IF(A(K).NE.BLANK)GO TO 20
      K=K-1
      IF(K.GT.0)GO TO 10
      RETURN
   20 J=MAX0(1,(133-K)/2)
      PRINT 1000,(BLANK,I=1,J),(A(I),I=1,K)
      RETURN
 1000 FORMAT(133A1)
      END
```

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```
      SUBROUTINE PAGE(L,N)
      INTEGER L,N
      L=L+N
      IF(L.LE.50)RETURN
      L=1
      CALL TITLE
      PRINT 1000
      RETURN
 1000 FORMAT(*DISTRIBUTED*,10X,*    UTILIZATION    CONNECTIVITY*,10X,*TOTA
     SL*///)
      END
```

C-49

```
      INTEGER FUNCTION MATCH(A,K,N)
      INTEGER A,K,N(I),I
      DO 10 I=1,K
10    IF(A.EQ.N(I)) GO TO 20
      I = 0
20    MATCH = I
      RETURN
      END
```

```
      INTEGER FUNCTION SPDCLS(N)
      INTEGER N
      IF(N.GE.2400)GO TO 10
      SPDCLS=1
      IF(N.GE. 600)SPDCLS=2
      RETURN
   10 SPDCLS=3
      RETURN
      END
```

```
      REAL FUNCTION TOTAL(N,A,M)
      INTEGER I,J,N,M
      REAL A(1)
      TOTAL=
      J=1
      DO 10 I=1,N
      TOTAL=TOTAL+A(J)
   10 J=J+M
      RETURN
      END
```

```
      INTEGER FUNCTION SUM(K,N,MR)
      INTEGER K,N(15),MR,J
      SUM = 0
      J = 1
      DO 10 I=1,K
      SUM = SUM + N(J)
   10 J = J+MR
      RETURN
      END
```

```
      SUBROUTINE CLEAR(N,X)
      INTEGER I,N
      REAL X(1)
      DO 10 I=1,N
10    A(I)=0
      RETURN
      END
```

APPENDIX D

AUTODIN USAGE AND BUDGET DATA

AUTODIN USAGE AND BUDGET DATA

The following tables, assembled from similar tables furnished by DCA, are offered to provide perspective on the cost allocation history of the AUTODIN system.

Table D-1*

DEFENSE COMMUNICATIONS AGENCY
COMMUNICATIONS SERVICES INDUSTRIAL FUND
BUDGET ESTIMATE

TOTAL REVENUES AND EXPENSES
(Dollars in Thousands)

Description	FY 1974 Actual	FY 1975 Actual	FY 1976 Actual	FY 19TQ Estimate	FY 1977 Estimate	FY 1978 Estimate
A. Revenues						
AUTOVON	82,280	78,890	75,396	18,203	85,146	88,833
AUTODIN	53,688	52,550	43,277	10,319	48,587	53,869
All Other Leased Communications Services	254,216	250,117	256,922	64,978	257,567	257,498
Total Revenue	390,184	381,557	375,595	93,500	291,300	400,200
B. Expenses						
Contractual Services						
AUTOVON	82,463	81,684	79,764	19,837	78,297	87,101
AUTODIN	52,289	47,753	45,003	11,506	47,358	50,657
All Other Leased Communications Services	251,687	247,902	256,363	64,903	258,240	248,758
Overhead (DECCO Operations)						
Salaries & Related Expenses	2,829	3,082	3,274	863	3,613	3,786
Contractual Services	298	676	348	85	564	636
Materials & Supplies	105	172	98	25	101	110
Other	274	387	372	181	427	452
Total Expenses	389,945	381,656	385,222	97,400	388,600	391,500
Non-Add: Military Personnel Services	(819)	(856)	(869)	(218)	(892)	(906)

*Source of all tables in Appendix D is the Defense Communications Agency.

Table D-2

DEFENSE COMMUNICATIONS AGENCY
COMMUNICATIONS SERVICES INDUSTRIAL FUND
BUDGET ESTIMATE

CUSTOMER REVENUES - ALL MISSIONS
(Dollars in Thousands)

Description	FY 1974 Actual	FY 1975 Actual	FY 1976 Actual	FY TQ Estimate	FY 1977 Estimate	FY 1978 Estimate
Army						
AUTOVON	19,739	19,225	18,022	4,341	20,743	20,445
AUTODIN	13,294	14,324	12,372	2,943	14,073	16,386
All Other Leased Communications Services	50,042	48,560	48,504	11,870	38,999	37,379
Sub Total	83,075	82,109	78,898	19,154	73,815	74,210
Navy						
AUTOVON	14,090	14,083	13,628	3,277	15,151	15,800
AUTODIN	10,470	10,924	10,219	2,446	11,161	9,763
All Other Leased Communications Services	27,675	29,711	30,758	7,947	33,187	35,827
Sub Total	52,235	54,718	54,605	13,670	59,499	61,390
Air Force						
AUTOVON	43,851	40,669	39,049	9,517	44,173	47,076
AUTODIN	24,473	21,128	15,312	3,752	17,057	18,362
All Other Leased Communications Services	112,439	105,435	102,793	26,079	106,160	103,363
Sub Total	180,763	167,232	157,154	39,348	167,390	168,801
Other DoD						
AUTOVON	3,737	4,097	3,941	896	4,161	4,683
AUTODIN	4,694	5,484	4,273	910	5,078	8,319
All Other Leased Communications Services	11,604	12,786	15,834	4,237	16,752	14,122
Sub Total	20,035	22,367	24,048	6,043	25,991	27,124
Other Non-DoD						
AUTOVON	863	816	756	172	918	829
AUTODIN	757	690	1,101	268	1,218	1,039
All Other Leased Communications Services	52,456	53,625	59,033	14,845	62,469	66,807
Sub Total	54,076	55,131	60,890	15,285	64,605	68,675
TOTAL REVENUE	390,184	381,557	375,595	93,500	391,300	400,200

D-3

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Table D-3

DEFENSE COMMUNICATIONS AGENCY
COMMUNICATIONS SERVICES INDUSTRIAL FUND
BUDGET ESTIMATES
AUTODIN
ANALYSIS OF REVENUE FROM COMMON USER

(By number subscribers, weighted units and thousands of dollars)

Customer/ Service Offering (Baud)	FY 1974 - Actual Subscribers E/Y	Avg	Wt. Units	Dollars	FY 1975 - Actual Subscribers E/Y	Avg	Wt. Units	Dollars	FY 1976 - Actual Subscribers E/Y	Avg	Wt. Units	Dollars	FY 19TQ Subscribers E/Y	Avg
Army														
Mag Tape (2400/4800)	39	35	10,190	3,821	42	42	13,392	4,861	43	43	7,177	3,840	43	43
High Speed (1200)	48	47	9,024	3,384	38	39	8,256	3,650	42	40	4,320	2,311	42	42
Intermediate (600)	46	49	7,056	2,646	45	40	6,048	2,375	46	46	4,968	2,658	46	46
Medium Speed (300)	34	34	3,264	1,224	35	40	3,840	1,205	32	34	1,224	655	30	30
Low Speed (150)	49	50	2,400	900	41	44	2,112	939	28	35	1,260	674	28	28
TTY (75)	142	147	3,528	1,319	126	130	3,120	1,294	106	116	4,176	2,234	106	106
TOTAL	358	362	35,462	13,294	327	335	36,768	14,324	297	314	23,125	12,372	295	295
Navy														
Mag Tape (2400/4800)	8	8	2,422	901	9	9	2,736	1,213	7	8	1,344	719	7	7
High Speed (1200)	63	64	12,288	4,578	70	68	13,056	4,781	67	68	7,344	3,929	70	70
Intermediate (600)	15	15	2,160	804	17	16	2,016	638	15	16	1,728	924	14	14
Medium Speed (300)	36	38	3,648	1,357	35	34	3,264	1,490	33	34	1,224	655	38	38
Low Speed (150)	51	53	2,544	946	45	47	2,400	1,330	43	43	1,521	814	40	40
TTY (75)	195	211	5,064	1,884	181	183	4,560	1,472	161	165	5,940	3,178	158	158
TOTAL	368	389	28,126	10,470	357	357	28,032	10,924	326	334	19,101	10,219	327	327
Air Force														
Mag Tape (2400/4800)	39	38	10,682	4,753	37	38	11,232	3,506	35	35	5,796	3,101	40	40
High Speed (1200)	97	99	19,008	8,459	73	75	14,976	7,505	65	69	7,452	3,987	66	66
Intermediate (600)	58	56	8,064	3,588	49	48	6,912	3,293	45	46	4,860	2,600	45	45
Medium Speed (300)	106	102	9,792	4,357	139	139	13,344	4,723	138	138	4,968	2,658	136	136
Low Speed (150)	75	83	3,984	1,772	48	50	2,640	943	26	37	1,332	713	26	26
TTY (75)	133	144	3,456	1,544	128	130	3,240	1,158	106	114	4,213	2,253	117	117
TOTAL	508	522	54,986	24,473	474	480	52,344	21,128	415	439	28,621	15,312	430	430
Other DoD														
Mag Tape (2400/4800)	22	20	6,353	2,408	24	24	7,728	3,398	24	24	4,032	2,157	27	27
High Speed (1200)	18	18	3,456	1,310	17	18	3,725	1,275	15	16	1,728	924	17	17
Intermediate (600)	8	8	1,152	437	7	7	1,008	424	8	8	864	462	8	8
Medium Speed (300)	1	1	96	36	5	3	192	35	4	3	117	63	2	2
Low Speed (150)	6	6	288	109	7	7	336	122	8	8	288	154	7	7
TTY (75)	22	22	1,056	394	26	26	480	230	20	23	849	513	23	23
TOTAL	77	75	12,401	4,694	86	85	13,469	5,484	79	82	7,878	4,273	84	84
Non-DoD														
Mag Tape (2400/4800)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
High Speed (1200)	1	1	192	76	2	2	390	144	2	2	216	109	1	1
Intermediate (600)	4	3	362	143	2	4	448	213	2	3	324	168	2	2
Medium Speed (300)	2	1	86	34	3	3	240	107	1	2	72	37	3	3
Low Speed (150)	4	4	142	56	2	4	183	71	4	4	144	74	5	5
TTY	52	52	1,139	448	44	48	608	154	42	42	1,410	713	40	40
TOTAL	63	61	1,921	757	53	61	1,869	690	51	53	2,166	1,101	51	51
Total AUTODIN Revenue	1,374	1,409	132,896	53,688	1,297	1,318	132,482	52,550	1,168	1,222	80,891	43,277	1,187	1,187

[1]The increase in weighted units, over FY 1977, is due to the inclusion of those weighted units associated with the off-base termi back-side of Automated Message Processing Equipment (AMPE).

| ollars | FY 19TQ - Estimate | | | | FY 1977 - Estimate | | | | FY 1978 - Estimate | | | |
	Subscribers E/Y	Avg	Wt. Units	Dollars	Subscribers E/Y	Avg	Wt. Units	Dollars	Subscribers E/Y	Avg	Wt. Units	Dollars
3,840	43	43	1,785	932	48	46	7,644	4,525	64	64	10,668	5,387
2,311	42	42	1,134	592	55	49	5,292	3,133	85	90	9,720	4,909
2,658	46	46	1,242	648	45	45	4,860	2,877	38	43	4,644	2,345
655	30	30	270	141	22	22	792	469	23	23	828	418
674	28	28	252	132	28	28	1,008	597	34	34	1,224	618
2,234	106	106	954	498	116	116	4,176	2,472	124	149	5,364	2,709
12,372	295	295	5,637	2,943	314	306	23,772	14,073	368	403	32,448	16,386
719	7	7	294	153	12	10	1,680	995	12	12	2,016	1,018
3,929	70	70	1,890	987	71	71	7,668	4,540	67	70	7,560	3,819
924	14	14	378	197	15	13	1,404	831	15	15	1,620	818
655	38	38	342	179	39	39	1,404	831	53	47	1,692	854
814	40	40	360	188	46	46	1,656	980	58	51	1,836	927
3,178	158	158	1,422	742	140	140	5,040	2,984	106	128	4,608	2,327
10,219	327	327	4,686	2,446	323	319	18,852	11,161	311	323	19,332	9,763
3,101	40	40	1,680	877	47	41	6,888	4,078	48	48	8,064	4,072
3,987	66	66	1,782	930	66	66	7,128	4,220	70	70	7,560	3,818
2,600	45	45	1,215	634	44	44	4,752	2,813	99	99	10,692	5,399
2,658	136	136	1,224	639	136	136	4,896	2,898	136	136	4,896	2,472
713	26	26	234	122	26	26	936	554	26	26	936	474
2,253	117	117	1,053	550	117	117	4,212	2,494	117	117	4,212	2,127
15,312	430	430	7,188	3,752	436	430	28,812	17,057	496	496	36,360	18,362
2,157	27	27	780	407	29	29	4,872	2,884	29	29	4,872	2,461
924	17	17	459	240	16	16	1,728	1,023	86	86	9,334	4,714
462	8	8	216	113	8	8	864	511	9	9	972	491
63	2	2	18	10	1	1	36	21	2	2	72	36
154	7	7	63	32	7	7	252	149	9	9	324	163
513	23	23	207	108	23	23	828	490	25	25	900	454
4,273	84	84	1,743	910	84	84	8,580	5,078	160	160	16,474	8,319
0	0	0	0	0	0	0	0	0	0	0	0	0
109	1	1	27	14	1	1	108	64	1	1	108	55
168	2	2	54	28	2	2	216	128	2	2	216	109
37	3	3	28	15	3	3	108	64	3	3	108	55
74	5	5	45	23	5	5	180	107	5	5	180	91
713	40	40	360	188	40	40	1,446	855	40	40	1,446	729
1,101	51	51	514	268	51	51	2,058	1,218	51	51	2,058	1,039
43,277	1,187	1,187	19,768	10,319	1,208	1,190	82,074	48,587	1,386	1,433	106,672[1]	53,869

ith the off-base terminals on the

Table D-4

DEFENSE COMMUNICATIONS AGENCY
COMMUNICATIONS SERVICES INDUSTRIAL FUND
FY 1978 BUDGET ESTIMATE

ANALYSIS OF AUTODIN BACKBONE PROGRAM AND EXPENSES
(Dollars in Thousands)

Description	FY 1976 - Actual		FY 19TQ - Estimate		FY 1977 - Estimate		FY 1978 - Estimate	
	Number	Costs	Number	Costs	Number	Costs	Number	Costs
Program Data								
Number of Operational Switches (E/Y)								
CONUS	8	XXX	8	XXX	8	XXX	8	XXX
Overseas (Includes Hawaii)	9	XXX	9	XXX	9	XXX	9	XXX
Expenses								
Switching Centers								
Leased Switches		29,322		7,450		30,168		32,372
Amortization		626		153		701		690
O&M of Switching Centers		11,794		3,043		12,918		13,890
Other and Non-Recurring		158		45		195		215
Total Switching Centers		41,900		10,691		43,982		47,167
Trunks (Number E/Y)								
CONUS	20	333	20	90	20	356	20	384
Overseas								
Europe	9	675	11	185	11	752	11	813
Pacific	12	972	12	245	12	1,030	12	1,115
Total Trunks	41	1,980	43	520	43	2,138	43	2,312
AUTOVON Support (Interconnects)		1,122		295		1,238		1,178
Overhead		436		120		470		497
SUB-TOTAL		--		--		--		--
FY 1978 Add-On for Prior FY Losses		--		--		--		2,710
TOTAL AUTODIN BACKBONE EXPENSE		45,438		11,626		47,828		53,864
NON-ADD: MILITARY PERSONNEL SERVICES		(153)		(38)		(161)		(172)